United States Department of Agriculture
Forest Service

Botanical Resources Report Including Sensitive and Survey and Manage Vascular Plants, Bryophytes, Fungi, and Lichens; Down wood Analysis; and Invasive Plant Risk Assessment

Shasta Agness Landscape Restoration Project

Rogue River-Siskiyou National Forest
Gold Beach & Wild Rivers Ranger Districts
Curry and Coos Counties, Oregon

Siskiyou trillium (*Trillium kurabayashii*), a sensitive plant found in oak woodlands, emerging in an area burned by prescribed fire in the Shasta Agness Project Area.

/s/ Kailey L. Clarno **Date: October 30, 2018**

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Contents

List of Tables

1. Introduction

Botanical resources in this report include plant, lichen and fungi species, communities and functional groups, as well as ecosystem processes and functions related to down coarse woody debris (hereafer referred to as down wood) within the Shasta Agness Landscape Restoration Project (hereafter referred to as the Shasta Agness Project). This report will analyze effects from specific actions within each alternative to vascular plants, epigeous and hypogeous fungi, lichenized fungi and bryophyte species that are listed as Threatened or Endangered under the Endangered Species Act (ESA), Sensitive by the Regional Forester per Forest Service Manual direction and/or Survey and Manage (SM) per the Northwest Forest Plan. This resource report will also compare the historic range of variability (reference condition) to the current condition for down wood recruitment and discuss the ecosystem services associated with this foundational forest structure, such as nutrient cycling, habitat for plants, fungi and animals, and general regulating services associated with the process of wood decay. Finally, this report will address the current invasive plant condition in relation to the potential for those species to colonize, spread and occupy ecological niches within and/or adjacent to the project.

Other resource topics and analyses were integrated into this report from the following interdisciplinary team member reports:

a) Topographic context, geologic landform types, soil structure and composition are described in the Soils and Geology analysis.

b) Down wood is also discussed within the Wildlife and Silviculture reports. Information from those documents is incorporated and referenced here.

c) Forest structure and general composition is described in the Silviculture report and affects overall botanical diversity so that information is incorporated and referenced here.

d) Fire regimes and vegetation condition class are described within the Fuels and Fire Ecology report and play a vital role in biodiversity maintenance so are incorporated or referenced here.

The Environmental Impact Statement (EIS) document for the Shasta Agness Project incorporates and summarizes the information in this report. This report fulfills requirements outlined in the 1989 Siskiyou Land and Resource Management Plan (LRMP) to complete a Biological Effects (BE) assessment for all Sensitive listed plant species on the forest. It also fulfills policy requirements described in Forest Service Manual 2900 with regard to completing risk assessments for the spread of invasive plant species.

Proposed Project Location

The Shasta-Agness Landscape Restoration Project (Shasta Agness Project) is located approximately 30 miles northeast of Gold Beach, Oregon, on the Gold Beach Ranger District of the Rogue River- Siskiyou National Forest, Curry County, Oregon and in portions of the Wild Rivers Ranger District including slivers of Coos County. The proposed project encompasses all or portions of Township 36 South- Range 13 West, Sections 5, 6, 7, 8, 9, 10, 17, 18, 19, 29 and 30, Willamette Base Meridian. The landscape encompasses all of the Shasta Costa 5th field watershed, the Stair Creek 5th field watershed and a small portion of the lower end of the Lawson 5th field watershed. These watersheds combine to make up a portion of the greater lower Rogue River watershed. The planning area is approximately 93, 000 acres.

Effects Analysis Methodology

Area of Effect for Botanical Resources

The geographic boundary for analyzing effects to botanical resources is the project area and an additional 100 feet around the perimeter. This area was chosen to include all sensitive species that are known to occur within project treatment units, occur along access routes, as well as have habitat and a "source" (e.g. potential for seed dispersal) population within close proximity to proposed activities.

Area of effect for the down wood analysis is the 5th field watershed level. In this case that includes two and a quarter watersheds (Shasta Costa, Stair Creek and ¼ portion of Lawson).

The geographic boundary for analyzing the risk of invasive plant infestations is the project boundary, an additional one mile around the project area.

Analysis Methodology

Threatened, Endangered, Sensitive (TES) and Invasive plant corporate data is housed within the Forest Service Natural Resource Manager Threatened, Endangered, Sensitive/ Invasive Species database (NRM TESP/IS) and was used for project analysis through ArcMap (GIS). Personal knowledge and local guides supplemented that data. For species designated as regionally sensitive by the Forest Service, information and documents from the interagency special status/sensitive species program (ISSSSP) were used. Access to the website was at http://www.fs.fed.us/r6/sfpnw/issssp/ and is open to the public. When available, the following documents were relied upon for analysis: conservation assessments, species fact sheets, survey reports, and management guidelines.

The project area was reviewed using aerial photographs, soils maps and known occurrences to help determine potential habitat for rare species.

Botanical field surveys have been conducted on approximately 4,000 acres within the project area. These include surveys completed in 2009 for the Agness Fuels Project, and in 2010 and 2011 for the Lower Rogue Integrated Vegetation Strategy (LRIVS) as well as surveys for this project, which were completed spring of 2017 in areas with potential habitat not surveyed during previous efforts.

Finally, data from past and current surveys were imported into a Geographic Information System (GIS) and used to identify effects and to develop mitigation measures.

Specific Assumptions

The following assumptions were used in the analysis of botanical resources:

1. Fire exclusion has reduced coarse and fine scale heterogeneity within the landscape (Halofsky et al, 2011). Oak savanna and ultramafic habitats have experienced decreased plant biodiversity due to this (Sahara et. al. 2015.).

2. Invasive plant species have a high potential to increase in distribution, cover and abundance within the project area post implementation. A threshold of 10% or less increase across the project within 5 years is assumed as a likely and an acceptable level of risk.

3. Project Design Criteria (PDC) would be implemented as recommended. Doing so would lead to acceptable levels of invasive plant spread, conserve populations of Sensitive and Survey and Manage species and maintain down wood levels that fall within the range of historic variability as

defined by DecAid. Implementing these PDC is essential to the effects determinations being made in this analysis.

4. Based on DecAid analysis the landscape as a whole has down wood conditions that are indicative of fire exclusion. Current coarse woody debris cover is assumed to be higher than the reference condition, particularly within the smaller diameter size classes.

5. Direct and indirect effects to Sensitive plant species during implementation of this project may be detrimental or beneficial, depending upon the species and its suitable habitat requirements and biological needs.

Cumulative Effects Boundaries

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions, because they reflect the aggregate impact of prior human actions and natural events that have affected this environment.

Activities occurring or reasonably certain to occur on Forest Service lands within the 5th field watershed include variable density thinning, meadow restoration treatments (commercial timber harvest, slash treatments, and prescribed fire), non-commercial meadow restoration, fuel wood cutting, road maintenance, and invasive plant treatments.

Botanical Resource Indicators and Measures

The following indicator measures related to treatments located in or near rare plant occurrences or habitats were used to assess the impacts of the alternatives for each action.

Indicator Measures:

- Acres of rare plant sites within 100 feet of proposed treatment units
- Total number of known rare plant sites within 100 feet of proposed treatment units
- Acres of invasive plant infestations within 100 feet of proposed treatment units

Short-term timeframe: 1 year, because it is within one year (the next growing season) that impacts to plants could first take effect by decreased numbers of individuals or decreased acres of coverage by individuals.

Long-term timeframe: 25-30 years, because climate change, unforeseeable future projects, demographic changes, etc. make assumptions beyond this timeframe speculative.

Spatial Boundary: Treatment units within the Shasta Agness Project Area, because in general, direct effects are most likely to occur within a zone of 30 feet from the edge of proposed project activities and indirect effects are most likely to occur within a zone of 100 feet.

Methodology: GIS analysis of proposed treatment units, buffered by 100 feet, to determine the distance between proposed treatment units and sensitive plant locations known or found during project surveys. The analysis considers the type of proposed treatment and its potential and likely effects on sensitive plants.

2. Regulatory Framework

Land and Resource Management Plan

The Shasta Agness Project is subject to the standards and guidelines contained in the Final Environmental Impact Statement Siskiyou National Forest Land and Resource Management Plan (hereafter, referred to as the LRMP) (USDA 1989a) and as amended. The Siskiyou National Forest Land and Resource Management Plan Record of Decision (USDA 1989b) was issued based on the evaluation presented in the 1989 LRMP. Primary amendments are: the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (referred to as the Northwest Forest Plan) (USDA, USDI, 1994).

Forest-wide Standards and Guidelines for TES Plants (see LRMP- IV pg. 26-27, 37)

1. Monitor the effects of management activities on TES plant species. If the results of monitoring show a decline in species viability then, alter the management strategy.

2. Analyze the potential effects of all ground disturbing projects on TES plant species and habitat. Mitigate project effects to avoid a decline in species viability at the Forest level.

3. Map, record, and protect essential habitat for TES plant species. Species management guides should be prepared to address the effects of land management activities on local populations of TES species at a broader scale, and to identify opportunities to enhance and develop habitat locally.

Endangered Species Act

It is mandate that the Forest Service (FS) conduct its activities and programs to assist in the identification and recovery of threatened and endangered plant species and avoid actions which may cause a species to become threatened or endangered.

The Rogue River-Siskiyou National Forest currently has two known and one suspected plant species that are listed as threatened or endangered under the ESA; however, these three plant species have no potential habitat within the proposed project footprint.

The National Forest Management Act of 1976

The National Forest Management Act (NFMA) of 1976 contains language relating to diversity and species viability that guides decisions and management for native plant species on Forest Service lands. The language in the 1982 planning rule that informed the Siskiyou NF LRMP states that "management prescriptions, where appropriate and to the extent practicable, shall preserve and enhance the diversity of plant and animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which would be expected in a natural forest and the diversity of tree species similar to that existing in the Planning Area."

Invasive Species, EO 13112 of February 3, 1999 as amended, December 05, 2016

Requires federal agencies to prevent the introduction, establishment, and spread of invasive species; detect and respond rapidly to eradicate or control populations of invasive species in a manner that is cost-effective and minimizes human, animal, plant, and environmental health risks; monitor invasive species populations accurately and reliably; and provide for the restoration of native species, ecosystems, and other assets that have been impacted by invasive species.

3. Proposed Action and Alternatives

A detailed description of proposed activities can be found in the Shasta Agness Landscape Restoration Environmental Impact Statement (EIS), specialist reports and supporting documents on the project website at: http://www.fs.usda.gov/project/?project=49607.

Project Design Criteria for Botanical Resources

Project Design Criteria (PDC) listed below (Table 1) are in addition to standards and guidelines from the Siskiyou National Forest Land and Resource Management Plan (USDA Forest Service 1989). The efficacy of these measures was included when assessing effects to botanical resources from proposed activities.

Table 1. Project Design Criteria to prevent or minimize risk of adverse effects to botanical resources.

Resource	Project Design Feature/ Mitigation Measure	Objective	Where Applicable
Sensitive Plants	Additional sensitive plant sites found during the life of this project would be documented in the project record, an assessment would be completed, and project design criteria would be applied.	Reduce the risk of inadvertent loss of undiscovered sites.	All units
Sensitive Plants	Coordination in the form of a layout strategy must occur between timber sale layout staff, Sale Administration and the District Botanist before implementation can commence due to the large number of Sensitive plant species in the project units. Coordination includes field visits, exchange of maps and GIS data as well as written direction on avoidance measures.	Reduce the risk of inadvertent loss of known sites.	All units
Sensitive Plants	Coordinate with the botanist during the burn plan and before implementation to protect *Cicendia quadrangularis* by measures such as wetting the surrounding vegetation with nonchlorinated, nonchemically treated water prior to prescribed burning to prevent consumption.	To minimize impacts to sensitive plant, *Cicendia quadrangularis* (Oregon timwort) growing in vernally wet areas.	Western portion of the oak flat meadow, Oak Flat Burn Block
Survey and Manage Plants and Lichens	Known Category A and B survey and manage plant and lichen occurrences would be buffered by 100 feet during implementation.	To minimize impacts to survey and manage species.	All unit
Invasive Plants	Prior to conducting operations, treat existing invasive plant infestations within the project areas under the existing weed management program where practicable.	Remove invasive plant seed source and prevent further spread of invasive plants within the project area.	Project Area and haul routes
Invasive Plants	Prioritize KV or Stewardship funds for monitoring and post-treatment of invasive plant species within the project area for at least 5 years after completion.	Avoid larger scale infestations by Early Detection Rapid Response surveys and treatment of blackberry and other problem invasive plants	Existing and potential future invasive plant sites
Invasive Plants	Do not stage equipment, materials, or crews in areas infested with invasive plant species where there is a risk of spread to areas of low infestation. Prior to implementation, a botanist would flag invasive plant infestations for pre-treatment or Designated Control Areas as appropriate. Designated Control Areas are locations where equipment and soil-disturbing project activities would be excluded. These areas would be	Make invasive plant sites visible to contractors and reduce the risk of inadvertent spread of invasive species.	Project Area and haul routes

	identified on project maps and delineated in the field with day-glow orange noxious weed flagging.		
Invasive Plants	Require all off-road equipment and vehicles (Forest Service and contracted) used for project implementation to be free of weeds. Clean all equipment and vehicles of all mud, dirt, and plant parts. This would be done at a vehicle washing station or steam-cleaning facility before the equipment and vehicles enter the project area.	Prevent transport and introduction of invasive plants from off-forest.	National Forest System Lands
Invasive Plants	Use only certified weed free straw/mulch if needed for erosion control or other purposes during road construction.	Prevent the inadvertent establishment of non-native species into the project area.	Project Area and haul routes
Invasive Plants	All rock sources for road work/construction must first be inspected by a Forest Service botanist to ensure they are weed free before being used.	Prevent the inadvertent establishment of non-native species into the project area.	Project Area and haul routes
Invasive Plants/Native Plants/Pollinators	A native plant revegetation plan would be developed by a botanist. Prescriptions for seedings should be developed prior to project implementation so that collection of local seeds can be accomplished during the previous field season.	Establish native early seral plant species for pollinator enhancement, invasive plant abatement and to deter further use of temp road and landing areas.	All units including Burn Between, landings, temporary roads.
Invasive Plants/Native Plants/Pollinators/ Wildlife	Revegetate decommissioned roads, temporary roads, landings, areas where invasive plants are removed and burned areas with native grasses and forbs where appropriate to reduce the risk of invasive plant establishment; benefit pollinators, ungulates and other early-seral species.	Establish native early seral plant species for pollinator enhancement, invasive plant abatement and to deter further use of temp road and landing areas.	All units including Burn Between, landings, temporary roads.
Invasive Plants/Native Plants/Pollinators	To the extent practicable, native plant materials shall originate from genetically local sources of native plants.	Establish native early seral plant species for pollinator enhancement, invasive plant abatement.	All units including Burn Between, landings, temporary roads.
Down wood	Existing dead wood - Avoid disturbance of existing snags ≥ 12" dbh and down wood ≥ 10' long & 12'' diameter on large-end to the greatest extent possible. Use treatment skips to avoid areas where these features are accumulated.	Minimize impact to species reliant on down wood.	All units.

4. Affected Environment

This section summarizes the existing landscape condition with relation to Threatened, Endangered and Sensitive (TES) and Survey and Manage listed plant and fungi species; invasive plants and ecosystem

processes and habitats associated with down wood. Describing the current condition within the greater Shasta Agness landscape provides context and establishes a baseline from which to measure effects to the resources covered in this analysis.

Existing Conditions

This approximately 92,000 acre planning area consists of highly variable terrain, geology, soils, climate, resulting in diverse vegetation patterns and composition. This diversity, resulting in part due to these highly variable abiotic conditions, has resulted in unique ecosystems that are a very important part of the overall ecosystem function. Additionally, the ecological importance and diversity of forests shaped by mixed severity regimes is widely recognized (Perry et al. 2011, DellaSala and Hanson 2015, Hessburg et al. 2016, Halofsky et al. 2011).

This project area is located in the northern portion of the Klamath Mountain range, in Siskiyou Mountain sub-range. The Klamath Mountains are geologically and biologically distinct from the Cascade and Sierra Nevada ranges, and are renowned for their exceptionally high levels of biological diversity (Whittaker 1960, DellaSala et al. 1999, Sawyer 2007, Grace et al. 2011). The rugged topography and the diverse edaphic conditions, including the highest concentration of serpentine bedrock and soil in North America, contribute to the diversity found in this region (Kruckeberg 1984, Grace et al. 2007, Damschen et al. 2010, Grace et al. 2011). Serpentine soil is a common name for soils derived from ultramafic parent material, such as peridotite and serpentinite, and often harbors uniquely-adapted vegetation due to the low availability of major plant nutrients and high concentrations of heavy metals (Kruckeberg 1954, Whittaker 1954, Coleman and Kruckeberg 1999, Brady et al. 2005). The diverse plant communities found in this part of the Klamath Mountains is no different than other parts of the mountain range, with a wide variety of plant communities, due in large part to the highly variable geologic formations and parent materials.

The Shasta Agness Project area overlaps with the Bearcamp Botanical Area along Bearcamp Ridge at the easternmost edge of the project area. There are plantation treatment units adjacent to the botanical area, but no treatments are proposed within the botanical area.

Plant Communities and Habitats

Oak and Pine Savanna and Woodlands

Oak communities along the west coast owe their existence to historical land management. Ten thousand years or more of seasonal burning of prairies by Native Americans maintained these open savannas (USDA 2010). The frequent, relatively cool fires spared the fire-resistant oaks and renewed the grasses of the meadows. The fires killed encroaching brush and trees, leaving oaks with plenty of sunlight. The fires also killed insects that ate or damaged the acorns sought by Native Americans. The exclusion of fire has allowed Douglas-fir and other vegetation to encroach and compete with the oaks. It is estimated that across the Pacific Northwest oak dominated ecosystems have been reduced to 10-20% of their distribution at the time of initial colonization by European settlers (Harrington and Devine 2006).

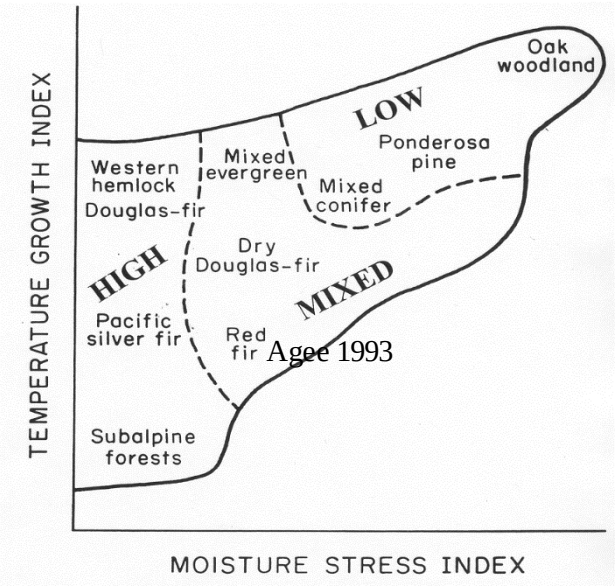
These unique ecosystems provide habitat for several endemic and sensitive plant species including California maidenhair fern (*Adiantum jordanii*), Oregon timwort (*Cicendia quadrangularis*), Siskiyou trillium (*Trillium kurabayashii*), and Leach's triteleia (*Triteleia hendersonii var. leachiae*).

Within the planning area, oak savanna and oak woodland habitats are being degraded and their extent is contracting due to fire exclusion and conifer encroachment. This has been observed on the ground and inferred from historic aerial photo interpretation. Encroachment is most pronounced where deep, well-drained, moist, loamy soils allow the proliferation of Douglas-fir. California black oak and Oregon white

oak presence is higher in soils characterized by a subsurface soil layer high in clay content and highly weathered (ultisols with an argillic horizon) or a weakly developed B horizon (inceptisols with a cambic horizon) (see soils specialist report). Douglas-fir encroachment is occurring in these soil types as well; however, Douglas-fir vigor is lower in these droughty soils resulting in slower encroachment and overtopping of the oaks. The oak savanna near the mouth of Shasta Costa Creek is one of the best known complexes of this habitat type (USDA and USDI 1995).

Historically these plant communities were characterized by Oregon white oak (*Quercus garryana*) scattered throughout open savanna conditions with California black oak (*Quercus kelloggii*) and canyon live oak (*Quercus chrysolepis*) interspersed in mixed conifer woodlands and within ecotones along the margins of open savannas. Due to 75 years of effective fire suppression along with colonization by non-native plants (particularly invasive annual grasses) the current distributional extent and ecological integrity of these ecosystems has been reduced within this landscape. The open savanna or meadow areas are largely dominated by herbaceous forb and grass species. Annual non-native grasses, especially hedgehog dogtail (*Cynosorus echinatus*), have infested many of these meadows and have become a dominant vegetation type causing a change in the ecology of these areas. However, some portions still have healthy populations of native grass species such as California fescue (*Festuca californica*), California oatgrass (*Danthonia californica*) and blue wild rye (*Elymus glaucus*).

Native Americans, and specifically the Shasta Costa tribe lived between Oak Flat on the Illinois River and Foster Bar. Anthropogenic (human-caused) fire was a major component of the Native system of land and resource management in what is now Oregon. Native Americans actively managed landscapes with fire to manage food resources and manipulate food-producing environments (Boyd 1999, Charnley et al. 2007). This regular practice of burning by the Shasta Costa tribe likely ended sometime around the 1850s when the Rogue Indian Wars were occurring. Most of the Rogue River Indians were moved to reservations by 1856. Although direct evidence in this area is scarce and piecemeal, stand structures, species composition, and known history of the area suggest that many of lower slopes of the planning area were actively managed with fire by the Shasta Costa tribe.



Agee 1993

These ecosystems may have naturally seen more fire as well. A local Biscuit fire study conducted by Halofsky et al. from 2011 validated Agee's model shown in the figure to the left. A pattern where vegetation preferring a higher temperature growth index and lower moisture stress index burn at higher severities while low lying areas in the warmer dryer (higher temp. growth index and higher moisture stress) tend to burn at lower severity. This is consistent with what is observed on the ground within this landscape at the present time. These ecosystems have a self-reinforcing pattern of distribution post disturbance, so there may be low probability for the rare plant species utilizing these habitats to disperse and colonize to other portions of the landscape.

Serpentine Pine Savanna

All of these stands are located in soils that developed from ultramafic parent materials such as peridotite and serpentinite.

Serpentine savannas in the project are characterized by an open Jeffrey pine, sugar pine, and incense cedar (*Calocedrus decurrens)* overstory with occasional patches of western white pine, knobcone pine, and Port-Orford-cedar and a more or less continuous herbaceous layer dominated by Roemer's fescue (*Festuca roemeri*) and patches of shub including Arctostaphylos spp. (manzanita), Quercus vacciniifolia (huckleberry oak), Rhamnus californica (coffeeberry), and Notholithocarpus densiflorus var. echinoides (shrub form tanoak. In drainages and concave slopes more Port-Orford-cedar and higher brush cover would generally be expected. Serpentine savannas are associated with one of the highest frequencies of sensitive and rare plants in the Klamath Mountains (Whittaker 1960, Duebendorfer 1987, Goforth and Veirs 1989, Jimerson et al. 1995, McGee Houghton 1995).

Observations suggest that many of these stands incurred frequent, low or mixed severity fires that maintained a late-open stand structure. As fire suppression in the planning area has occurred, the structure and composition of these stands has changed. Encroachment into grassland areas by dense regeneration of Jeffrey pine, incense cedar, tanoak, and shrub species has occurred. Douglas-fir and other species from the surrounding forest are also encroaching (Sahara 2014).

Plantations

In the project area, approximately 7700 acres of presumably old growth forests were removed through clearcutting from 1960 to 1997. Many of these areas (often on north or northwest facing aspects in the Siskiyou Mountains) coincided with late successional and old growth ecosystems. After harvest, these stands were typically planted with Douglas-fir and managed for future timber production. As a result, these stands typically lack structural and species diversity and are growing in dense and homogenous conditions in a degraded ecological state. Understory vegetation is suppressed causing low species richness, cover and overall diversity. The plantations this project is focusing on were not covered by other decisions, and were clear-cut harvested between 1960 and 1975.

Plantations within the planning area vary some in species composition and stand structure. Many of the plantations below 3000 feet elevation are in the tanoak plant series, while plantations above that elevation are in the Douglas-fir or white-fir series. The plantations were planted with Douglas-fir, so it now dominates the over story. Species that naturally regenerated and are present in stands include Shasta red fir (*Abies magnifica var. shastensis),* white fir (*Abies concolor*), tanoak, Pacific madrone (*Arbutus menziesii*), canyon live oak (*Quercus chrysolepis*), giant chinquapin (*Chrysolepis chrysophylla*), and potentially some sugar pine (*Pinus lambertiana*).

Naturally regenerated Sugar Pine-Mixed Conifer Stands

Sugar pine (*Pinus lambertiana*) is a seral species that often establishes after moderate to high severity wildfire. Seeds rest in the soil waiting for a disturbance that allows them to germinate and pioneer low productive sites with porous soils such as on ridges and southerly facing aspects. Sugar pine becomes more dominant on the mesic and maritime influenced ultramafic (peridotite and serpentinite) sites within the western portion of this planning area. These populations of sugar pine represent some of the most western distributed sites within the entire species range from central Oregon down into Baja California. Extensive high severity fires that burned in the early 20th century created sufficient opportunity for sugar pine to colonize areas within this planning area.

Those areas are now dominated by sugar pine (*Pinus lambertiana*), knobcone pine (*Pinus attenuata*), Douglas-fir (*Psuedotsuga menziesii*), giant chinquapin (*Chrysolepis chrysophylla*), western white pine (*Pinus monticola*), Jeffrey pine (*Pinus jeffreyi*), and other species. Large sugar pines that survived the fires have grown in open conditions for 70+ years, resulting large open grown tree form. Little to no regeneration of young seedlings or saplings of sugar pine can be found in any of the areas where this

species was once dominant. To compound issues with fire exclusion and homogenous seral states, this tree species is highly susceptible to insect and disease mortality.

In Southwest Oregon as elsewhere in the West, evidence is accumulating that sugar pine and western white pine are being threatened by the combination of white pine blister rust, a disease caused by an introduced pathogen, infestation by mountain pine beetle, a density dependent bark beetle species, and substantial increases in forest stocking associated with fire exclusion (Conklin et al. 2009, Harvey et al. 2008, Samman et al. 2003, van Mantgem et al. 2004). These sugar pine stands are no different, as there is evidence that sugar pine composition within these stands and across the landscape is decreasing.

Comparison of 1939 aerial photos to modern photos shows very stark contrasts in forest structure, especially with stands identified for sugar pine emphasis and serpentine areas. This change in forest structure is not favorable to maintaining a higher composition of sugar pine within this landscape.

Page 5 of the Southwest Oregon LSR assessment states, "Pine beetles and tree mortality are always present in the forest. However, with fire suppression increasing the number of stems per acre and subsequent increased moisture stress, the beetles have become epidemic during the past drought. In places, the overstocked understories have competed for moisture with the overstory component of Ponderosa or Sugar Pine. This drought and competition has left the overstory pine venerable to attack by pine beetles. 100 percent mortality of pines has occurred in these epidemic areas."

Botanical Species of Conservation Concern

Region 6 Sensitive Species

Additional information on regionally sensitive species can be found at the interagency special status/sensitive species program (ISSSSP) website at: http://www.fs.fed.us/r6/sfpnw/issssp/.

The Region 6 Regional Forester Special Status Species List, July 13, 2015, identifies the Rogue River-Siskiyou National Forest (RRSNF) as having 138 special status plant or fungi species documented from well over a thousand known populations. The listed taxa include 3 federally endangered vascular plants, 76 sensitive vascular plants, 14 sensitive bryophytes, 11 sensitive fungi and, 1 sensitive lichen species.

Sensitive Vascular Plants, Bryophytes and Lichens

Table 2. Sensitive plant and lichen species known to occur or with potential to occur in the Shasta Agness Project area based on their known distribution, range and habitat preference.

Species	Habitat/Distribution
Known to occur within the Shasta Agness Project Area.	
Adiantum jordanii (California maidenhair fern)	Growing under myrtle-wood along intermittent stream banks, moist draws and within moist rocky crevices. Elevations less than 3600 feet. Known from about 22 known occurrences along the Lower Rogue and Lower Umpqua river canyons of OR; very common in CA. 10 of those 22 occurrences occur within 100 feet of the Shasta Agness Project area.
Arctostaphylos hispidula (Gasquet manzanita)	Forest edges, brush fields and barren ridgelines with little to no conifer canopy cover. Often associated with serpentine soils and ultramafic geology, but not always. It is usually found growing with other manzanita species, especially the very common hairy manzanita (Arctostaphylos columbiana). *Arctostaphylos hispidula* is a fire dependent species with refractory seeds (Emerson 2010; Keeley 1991), though the needed intensity level of the fire is not known. It is an endemic species occurring in the western Siskiyou Mountains grading narrowly into the Coastal Range from Coos County, OR south into Humboldt County, CA. There are 5 known occurrences of this species within 100 feet of the Shasta Agness Project Area.
Bensoniella oregana (Oregon bensonia)	Seeps, springs, moist meadows and wet roadside ditches along upper slopes and ridges. Range is restricted to the Coast and Siskiyou Mountains In extreme SW Oregon and NW California. Elevations 2,800 to 5,200 feet. There are 36 known occurrences of this species within 100 feet of the Shasta Agness Project area.

Cicendia quadrangularis (Oregon timwort)	This annual herb grows in open places, vernally wet meadows & oak savanna. Klamath Mts., Columbia Basin, Willamette Valley. Also Sierra Nevada foothills and Coast Range CA; western S. America. There is one known occurrence of this species within the Shasta Agness Project Area.
Gentiana setigera (Waldo gentian)	Serpentine wet meadows and Darlingtonia bogs, seeps on slopes at elevations below 3,800 feet. There is one known occurrence of this species within the Shasta Agness Project Area within plantation unit 203.
Iliamna latibracteata (California globe-mallow)	This species prefers open canopied conditions but sometimes is found in partial shade. Iliamna latibracteata is found almost exclusively within openings in recently-burned forests dominated by white fir (Abies concolor) and/or Douglas-fir (Pseudotsuga menziesii). It can occur in the understory of top-killed stands, as well as at edges of or in gaps within live burned stands (Kalt, 2008). Many sites are adjacent to or within riparian areas. It is known to occur from 300-4000 feet in elevation. The species is endemic to the Siskiyou, western Cascade and Coast Range Mountains in Coos, Curry, Douglas, Jackson and Josephine Counties of southwest Oregon. The distribution ranges south to Humboldt County California. Multiple populations are no longer extant due to vegetative succession leading to dense overstory shading of the ground layer species. There are three known occurrences of this species within 100 feet of the Shasta Agness project area, none of which occur within any Shasta Agness treatment unit. One population occurs near plantation unit 218.
Monardella purpurea (Siskiyou monardella)	Rocky, open serpentine scrub forest, chaparral, woodlands and montane forest, 1,400-4,000ft. Curry, Jackson and Josephine Cos., OR; to central CA in Coast Range and Klamath Mts. There is one known occurrence of this species within 100 feet of the Shasta Agness Project Area near plantation unit 245.
Scirpus pendulus (drooping bulrush)	Marshes and wet meadows, river terraces, ditches, 2500 to 3000 ft. Clackamas, Curry, Jackson, Josephine, Linn and Marion Cos., OR; one site in CA near Yreka. There are three occurrences of this species within 100 feet of the Shasta Agness Project Area, two of which occur in the Wild Rogue Wilderness. One population occurs in the ditch of the road that runs through Oak Flat Meadow.
Trillium kurabayashii (Siskiyou trillium)	Coniferous forest, woodland, and chaparral at low to mid elevations. Lower Rogue canyon Curry Co., OR; sporadically through CA. There are 11 known occurrences of this species within 100 feet of the Shasta Agness Project Area, 7 of which occur within Shasta Agness treatment units.
Not found within the Shasta Agness Project Area.	
Cryptomitrium tenerum (liverwort)	Forming small to locally extensive mats on bare, usually shaded and humid soil on hillsides, rock outcrops, and streambanks. In Oregon between sea level and 1000 feet elevation. There is one known occurrence of this species in Oregon, which occurs just outside the Shasta Agness Project Area along the lower Rogue River Trail in the vicinity of a bridge over a small, unnamed stream drainage less than a half mile from the trailhead on the west (downstream) side of Agness, Curry County, Oregon. This species does not occur within 100 feet of any project unit, therefore there would be no effects.
Encalypta brevicollis (bryophyte)	On soil in shaded crevices in igneous rocks, along ridge tops with frequent fog penetration. Curry Co., OR; historic sites in WA; throughout Canada. There is one known occurrence of this species in the southeast edge of the Shasta Agness project area. There are no known occurrences of this species within any Shasta Agness treatment units, and therefore no effects.
Erigeron cervinus (Siskiyou daisy)	In rocky places or crevices on solid rock. Also in open areas, medium to high elevations and sometimes glaciated areas. River and stream banks at lower elevations, usually near seeps or vernally wet areas. Siskiyou Mts. of Curry and Josephine Cos., OR and Trinity, Del Norte and Siskiyou Cos., CA. There is one historical occurrence of this species within the Shasta Agness project area in the Oak Flat area that has not been relocated.
Frasera umpquaensis (Umpqua swertia)	Open woods or at edges of meadows. In mid to upper elevation true fir dominated forests or mixed conifer forests (4,000 to 6,000 feet). The distribution ranges the Rogue-Umpqua divide with small disjunct pops. Into Trinity Co., CA. There are three known occurrences of this species in the eastern-most portion of the Shasta Agness project area on the Wild Rivers Ranger District. There are no known occurrences of this species within any Shasta Agness treatment units, and therefore no effects.
Phymatoceros phymatodes (tuberous hornwort)	This species grows on bare, mineral soil which remains moist until late spring or summer. From near sea level to 2100 feet. There is one known occurrence of this species just outside of the Shasta Agness Project Area along the lower Rogue River Trail less than a half mile from the trailhead on the west (downstream) side of Agness, Curry County, Oregon. There are no known occurrences within the Shasta Agness project area, and therefore no effects.
*Sidalcea malviflora ssp. patula (*coast checker bloom*)*	Coastal. Open woodlands, openings within mixed forests, meadows, or grassy places at low elevations. Often serpentine. From Coos Co. OR south to Humboldt Co. CA. There are no known occurrences of this species within 100 feet of the project area, and therefore no effects.

Sensitive Fungi

Rare ephemeral fungi, such as gilled mushrooms, coral's, and clubs are treated separately from the above species because of the difficulty in surveying and detecting them prior to projects being implemented. Surveys for species presence are often difficult, because fungi can be seen only when fruiting bodies are produced. Even with above-ground fruiting bodies present, their correlation with the extent and abundance of the fungal organisms underground is unknown (Straatsma and Krisai-Greilhuber 2003). Because of the logistics and costs involved with completing surveys, which takes two years with several visits to each unit, the Forest Service Region 6 policy has been to manage these species at a broader landscape scale by conducting regional "strategic" surveys. These are surveys for the sake of finding new sites, not for clearance of a project. Therefore the effects analysis for fungi is based on existing knowledge of the distribution of each species and focuses on the likelihood of extirpation of a population at a 5th field watershed scale. In accordance with Region 6 Forest Service direction, Sensitive fungi surveys were not conducted in the Shasta Agness project.

There are fourteen fungi species listed as Forest Service Region 6 sensitive that are suspected or documented on the Rogue River-Siskiyou National Forest (*Albatrellus avellaneus, Chamonixia caespitosa, Dermocybe humboldtensis, Gastroboletus vividus, Gastrolactarius camphoratus, Gymnomyces fragrans, Phaeocollybia californica, Pseudorhizina californica, Ramaria amyloidea, Ramaria rubella forma blanda, Rhizopogon chamaleontinus, Rhizopogon ellipsosporus, Rhizopogon exiguous,* and *Stagnicola perplexa*).

Of these fourteen fungi, only *Gastrolactarius camphoratus* has reasonable likelihood of occurrence within the project area. For the other thirteen species there is no suitable habitat in the project area; the distance to the nearest known occurrence is substantial, and no local concentrations of the species are apparent.

This project area is not indicative of high potential fungal habitat due to a frequent fire regime and lack of high decomposition rates associated with established duff or humus layers on the forest floor. Landfire 2012 data suggest the historic fire return interval to be approximately 6-15 years in dry forest types of the Siskiyou Mountains; similar to the ones found in the Shasta Agness project.

In order to determine the likelihood of finding these Sensitive fungi species in the project area, several documents written by the Region 6 ISSSSP were referenced. These documents include:

- Fungi Effects Analysis Guidelines, 10/2008
- Attachment 1- Likelihood of Occurrence Key, 9/2004
- Attachment 2- Conservation Assessment for Fungi in Region 5 & 6, 7/2007
- Attachment 4 – Potential Impacts to Fungi Table; and Habitat Summary for Sensitive Fungi Species, 2007. (ISSSSP website: http://www.fs.fed.us/r6/sfpnw/issssp/species-index/flora-fungi.shtml)

Based on the information gleaned from these documents it is thought that there is low potential for any of these sensitive fungi to occur within the project area.

NWFP Survey and Manage Plants, Lichens, and Fungi

The 1993 Final Environmental Impact Statement (FSEIS) and 1994 Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (also known as the Northwest Forest Plan (NWFP)) created the survey and manage

standard and guideline for all land allocations on the west side of the Cascades in Oregon, Washington and northern California and east Cascade forests within the range of the northern spotted owl.

The standard and guidelines were created to gain information that could help manage a set of lesser known and possibly rare taxa. Species of fungi, lichens, bryophytes and vascular plants were included to determine the status of their population viability.

A memorandum was released on May 13, 2014 (Forest Service Correspondence, File Code 1950 – Direction Regarding the Survey and Manage Standards and Guidelines), providing direction for implementation of the January 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USFS et al. 2001), based on the district court's remedy order issued on February 18, 2014 (Conservation Northwest v. Bonnie, W.WA No. C08-1067-JCC). This remedy order followed after the 9th Circuit Court of Appeals rejected the 2011 Consent Decree executed in resolution of the district court action (Conservation Northwest, et al v. Harris Sherman, et al and D.R. Johnson Company, 715 F.3d. 1181, C.A. 9 (Wash), April 25, 2013).

The January 2001 ROD standards and guidelines and the December 2003 species list are the current management direction. Four categories of projects are exempt from the Survey and Manage standards and guidelines as stipulated by Judge Pechman (October 11, 2006, "Pechman exemptions".)

Within the December 2003 list, there are 12 species with changes/removals in all or a portion of their range that may need special consideration at this time. The species changes/removals included in this report are:

- Fungi: *Clavariadelphus truncatus* (outside Jackson Co. Oregon), *Craterellus tubaeformis* (in Washington and California), *Galerina atkinsoniana*, *Gomphus floccosus*, *Phaeocollybia olivacea*
- Lichens: *Chaenotheca furfuracea*, *Cladonia norvegica*, *Nephroma bellum* (in Oregon Western Cascades and Coast Range Physiographic Provinces; in Washington Western Cascades Physiographic Province, Gifford Pinchot NF), *Nephroma occultum*

The four categories of projects exempt from the Survey and Manage standards and guidelines as stipulated by Judge Pechman (October 11, 2006, "Pechman exemptions") are:

a) Thinning projects in stands younger than 80 years old;

b) Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;

c) Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement of large wood, channel and floodplain reconstruction, or removal of channel diversions; and

d) The portions of projects involving hazardous fuel treatments where prescribed fire is applied. Any portions of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and manage requirements except for thinning of stands younger than 80 years old under subparagraph (a) of this paragraph.

Information is also available at http://www.blm.gov/or/plans/surveyandmanage/.

Some treatments proposed in the Shasta Agness planning area are consistent with the four categories of projects exempt from survey and manage standards and guidelines as stipulated by Judge Pechman, including pre-disturbance surveys and known site management.

Burn blocks in between restoration units meet exemption (d) because thinning would be non-commercial; All stands younger than 80 years, including all plantation units, meet the exemption (a); and all non-thinning riparian and stream improvement treatments meet exemption (c).

Not included in the exemption are restoration of unique ecosystems such as oak savanna, oak woodland, serpentine savanna and sugar pine stands. Also not included are actions such as Port-Orford Cedar sanitation as well as recreation activities, occurring in stands over 80 years old.

Survey and manage species occurrence data was reviewed and it was determined that pre-disturbance surveys were required for one Category A lichen species known to occur within the Shasta Agness project, *Usnea longissima* (Table 3). No other category A or C botanical species have habitat within the project, so no other pre-disturbance surveys were required. *Usnea longissima* surveys were completed during the spring of 2017 by Gold Beach Ranger District Botanists.

Common and Scientific Name	**Category**	**Status On RRSNF**
LICHENS		
Leucogaster citrinus	B	Documented
Platismatia lacunosa, all except OR Coast Range	E	Documented
Usnea longissima, In California and in Curry, Josephine, and Jackson Counties, Oregon	A	Documented
FUNGI		
Rhizopogon truncatus	D	Documented
Surveys and Site Management to Consider Based on Category: **Category A** – conduct pre-disturbance surveys and manage all known sites; **Category B** – for the fungi & lichens, conduct equivalent-effort surveys in old-growth forest only and manage all known sites. **Category C** – conduct pre-disturbance surveys and manage high-priority sites; **Category D** – manage high-priority sites; **Category E** – manage all known sites; **Category F** – no requirement for project implementation; strategic surveys address information needs in relation to basic criteria for S&M; strategic surveys are the responsibility of the Regional Office and not field units.		

Category B fungi require "equivalent effort" surveys in old growth stands as defined by the NW Forest Plan ROD. These would be stands that are 175-220 years old (mean stand age) and which have large amounts of down wood, snags and multiple layered canopies. None of the proposed treatments in this proposal meet this criteria. Categories D, E and F do not require surveys.

For a full list of Survey and Manage species considered see Appendix A of the Shasta Agness Project Botanical Resources Report.

Table 3. Northwest Forest Plan Plants, Lichens and Fungi included in survey and manage standards and guidelines with the potential to occur within the Shasta Agness Project area (Dec. 2003 species list).

Common and Scientific Name	Category	Status On RRSNF
LICHENS		
Leucogaster citrinus	B	Documented
Platismatia lacunosa, all except OR Coast Range	E	Documented
Usnea longissima, In California and in Curry, Josephine, and Jackson Counties, Oregon	A	Documented
FUNGI		
Rhizopogon truncatus	D	Documented

Surveys and Site Management to Consider Based on Category: **Category A** – conduct pre-disturbance surveys and manage all known sites; **Category B** – for the fungi & lichens, conduct equivalent-effort surveys in old-growth forest only and manage all known sites. **Category C** – conduct pre-disturbance surveys and manage high-priority sites; **Category D** – manage high-priority sites; **Category E** – manage all known sites; **Category F** – no requirement for project implementation; strategic surveys address information needs in relation to basic criteria for S&M; strategic surveys are the responsibility of the Regional Office and not field units.

Down wood

The silvicultural diagnosis and wildlife reports contain an analysis of snags and down wood as they relate to animal habitat within the planning area. Covered here is an analysis of wood on the ground in relation to fungi habitat, mycorrhizae associations, microflora and ecological processes associated with decomposition in the forest system. An analysis tool known as DecAid was used to help quantify potential effects to these.

DecAid: Down wood Distributional Analysis

DecAID is an interagency developed internet-based summary, synthesis, and integration (a "meta-analysis") of the best available science: published scientific literature, research data, wildlife databases, forest inventory databases, and expert judgment and experience. The Decayed Wood Advisor (DecAid) Version 3.0 (https://apps.fs.usda.gov/r6_decaid/views/index.html) was utilized in order to qualitatively and quantitatively analyze the effects that implementing this project might have on forests at a landscape scale. This analysis helps to provide context in relation to the rest of the landscape the project falls within.

The mortality and subsequent decomposition of woody vegetation plays a vital role in forest ecosystem processes, affecting aspects such as resilience, biodiversity and fundamental regulating services. There are a wide array of nutrient cycling, trophic interactions and ecosystem processes that function as a result of carbon being slowly released back into the ecosystem through decomposition of dead wood. One of the most beneficial aspects for the ecosystem as a whole is the relationship between mycorrhizal fungi, down wood and most of the land plants, particularly conifer trees. Mutualistic symbiosis in the form of mycorrhizal association should be a fundamental consideration for project planning because of the importance it has on all other life in the forested environment.

Presented here is a distributional analysis of down wood abundance within forest service lands in the Shasta Costa Creek- Rogue River, Stair Creek- Rogue River, and Lawson Creek- Illinois River HUC 10 watersheds (Figure 1, Figure 2). The analysis focuses on the SW Oregon Mixed Conifer Wildlife Habitat Type (WHT) because it best represents the majority of plant composition and structural conditions for the watershed.

The distributional analysis considers a computed current cover distribution of down wood in relation to the range of reference or historical conditions for down wood levels in a given watershed.

Regional scale gradient nearest neighbor (GNN) modeling data from 2012 was utilized to estimate the current distribution of down wood within this landscape. The DecAid analysis assumes that GNN provides the best current scientific data on down wood ecosystem attributes (see this website for an explanation of GNN spatial data http://lemma.forestry.oregonstate.edu/methods). While not perfect at a site specific or stand level scale, GNN vegetation data helps to elucidate general trends at a coarse landscape scale.

Reference conditions on down wood were extrapolated from DecAid using data from ecological sampling of Current Vegetation Survey (CVS) and Forest Inventory Analysis (FIA) plots that occur on forest service lands. The reference data comes from plots where no prior management has occurred, though it should be noted that due to fire exclusion it is impossible to know exactly how representative given areas are of the historic range of variability (HRV). However, analysis of this vegetation plot data can help determine the "natural range of variability" for dead wood, which can be used as a proxy for HRV. An assumption is made that managing habitat within the HRV would allow for adequate amounts of down wood on the landscape. This coarse scale management strategy allows for maintenance of ecosystem function within what are considered historical variations. Maintaining conditions within those variations allows species such as mycorrhizal fungi to adapt and be resilient to natural or anthropogenic levels of change on the landscape. It is assumed that the further current conditions deviate from HRV the less likely adequate habitat is being provided to sustain native species.

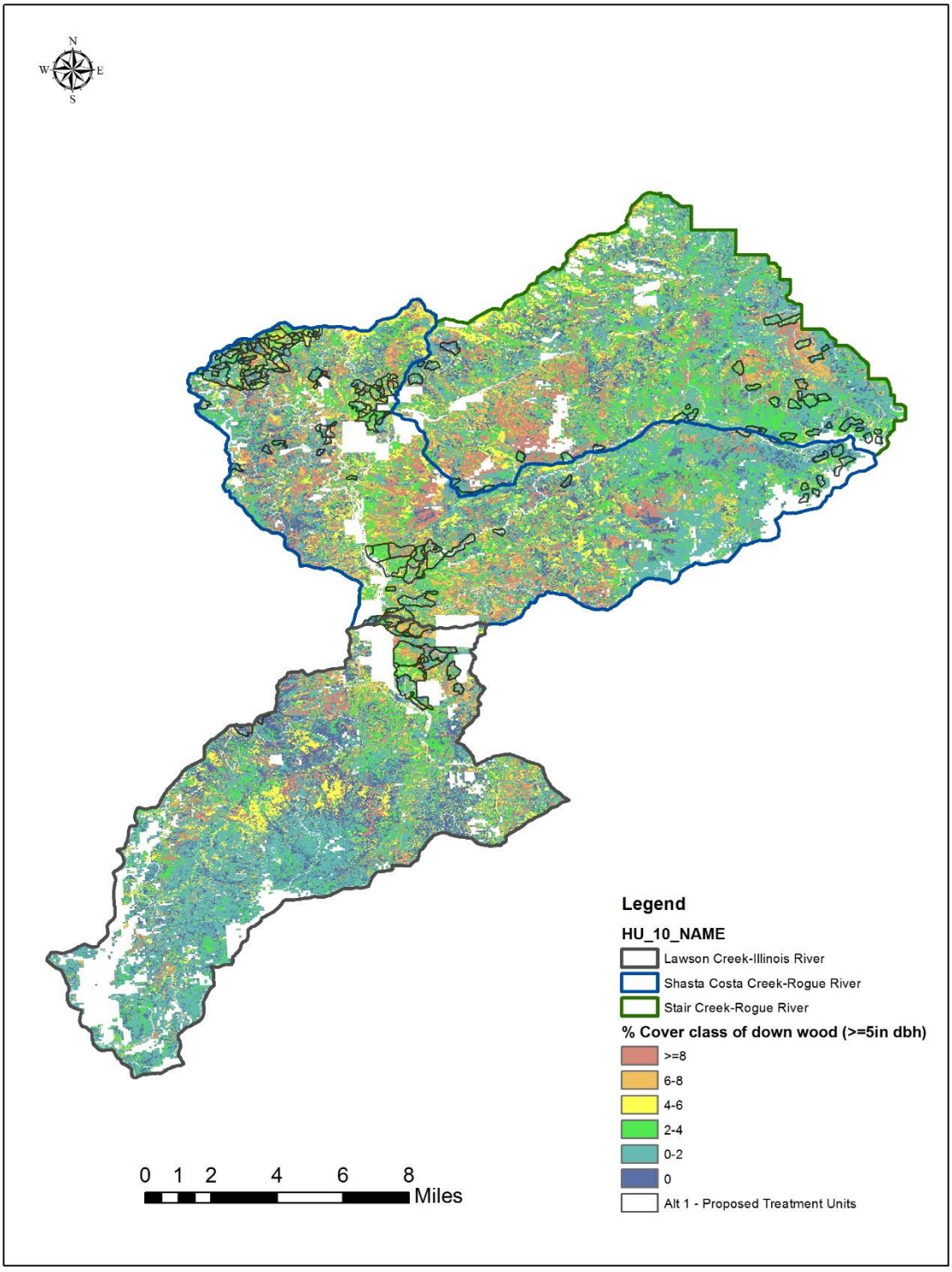


Figure 1. Percent cover distribution map for down wood within the ≥5" dbh size class in the Southwest Oregon Mixed Conifer Wildlife Habitat Type within the Shasta Costa Creek- Rogue River, Stair Creek- Rogue River, and Lawson Creek- Illinois River HUC 10 watersheds

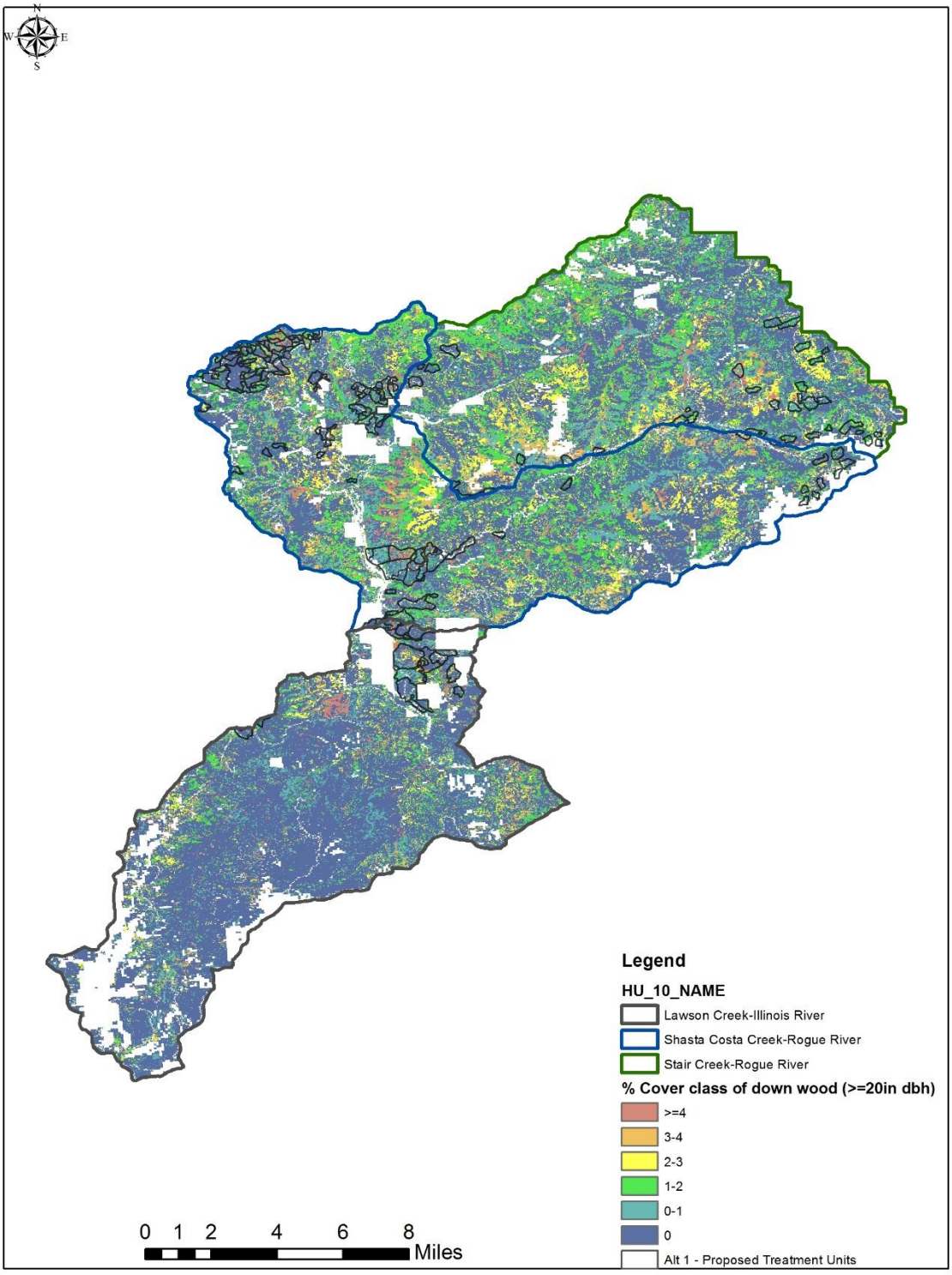


Figure 2. Percent cover distribution map for down wood within the ≥20" dbh size class in the Southwest Oregon Mixed Conifer Wildlife Habitat Type within the Shasta Costa Creek- Rogue River, Stair Creek- Rogue River, and Lawson Creek- Illinois River HUC 10 water

Table 8. Trend comparison of reference and current conditions for multiple size classes of down wood within the three watersheds in the project

Shasta Costa	≥5" Down wood - Percent Ground Cover Class					
	0	*0-2*	*2-4*	*4-6*	*6-8*	*≥8*
Reference/HRV Percent of Landscape	28%	42%	15%	8%	3%	5%
Current Percent of Landscape	14%	32%	19%	11%	9%	15%
Trend	↓14%	↓10%	↑4%	↑3%	↑6%	↑10%

Shasta Costa	≥20" Down wood - Percent Ground Cover Class					
	0	*0-1*	*1-2*	*2-3*	*3-4*	*≥4*
Reference/HRV Percent of Landscape	65%	7%	13%	6%	3%	7%
Current Percent of Landscape	53%	13%	17%	8%	5%	4%
Trend	↓12%	↑6%	↑4%	↑2%	↑2%	↓3%

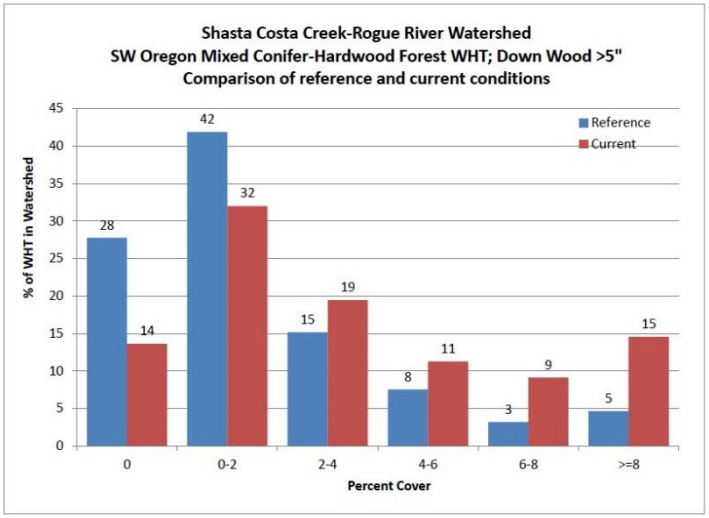
Stair Case	≥5" Down wood - Percent Ground Cover Class					
	0	*0-2*	*2-4*	*4-6*	*6-8*	*≥8*
Reference/HRV Percent of Landscape	28%	42%	15%	7%	3%	5%
Current Percent of Landscape	12%	33%	24%	10%	8%	13%
Trend	↓16%	↓9%	↑9%	↑3%	↑5%	↑8%

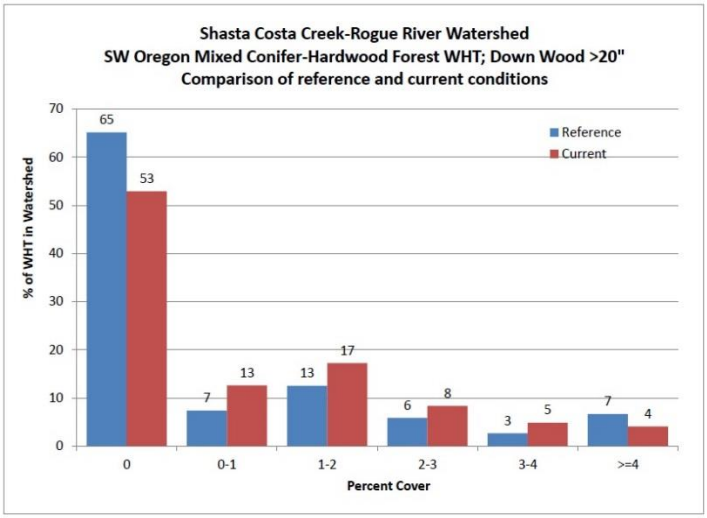
Stair Case	≥20" Down wood - Percent Ground Cover Class					
	0	*0-1*	*1-2*	*2-3*	*3-4*	*≥4*
Reference/HRV Percent of Landscape	66%	7%	12%	6%	3%	7%
Current Percent of Landscape	50%	15%	18%	10%	4%	4%
Trend	↓16%	↑8%	↑6%	↑4%	↑1%	↓3%

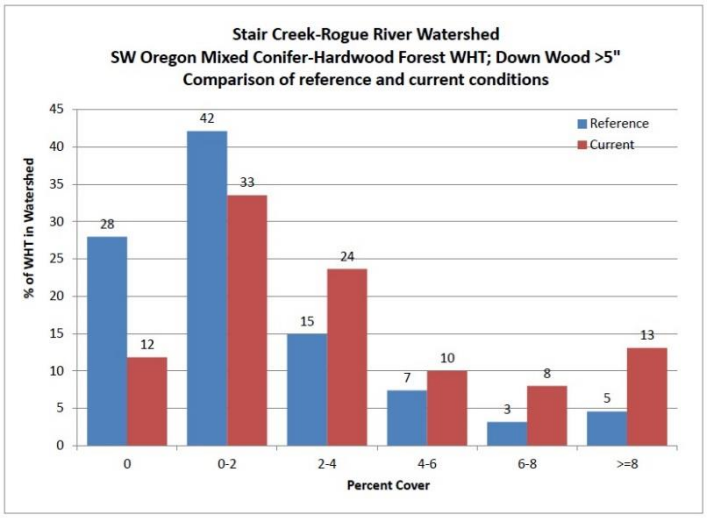
Lawson	≥5" Down wood - Percent Ground Cover Class					
	0	*0-2*	*2-4*	*4-6*	*6-8*	*≥8*
Reference/HRV Percent of Landscape	27%	41%	16%	8%	3%	5%
Current Percent of Landscape	22%	42%	13%	9%	5%	9%
Trend	↓5%	↑1%	↓3%	↑1%	↑2%	↑4%

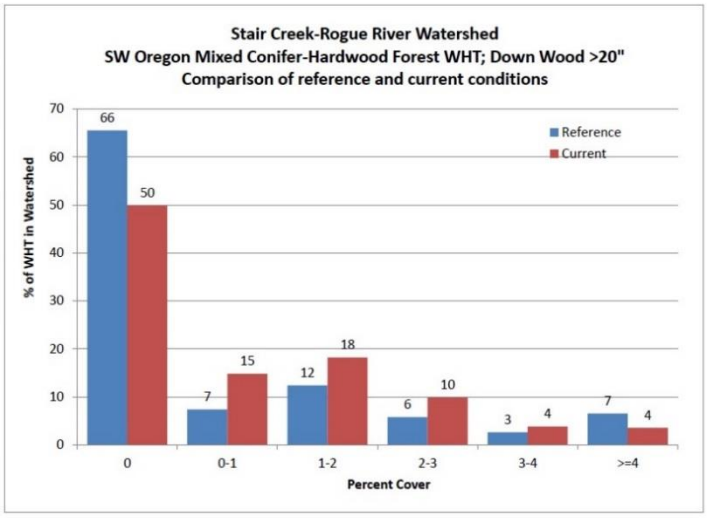
Lawson	≥20" Down wood - Percent Ground Cover Class					
	0	*0-1*	*1-2*	*2-3*	*3-4*	*≥4*
Reference/HRV Percent of Landscape	64%	7%	13%	6%	3%	7%
Current Percent of Landscape	75%	11%	6%	4%	2%	3%
Trend	↑11%	↑4%	↓7%	↓2%	↓1%	↓4%

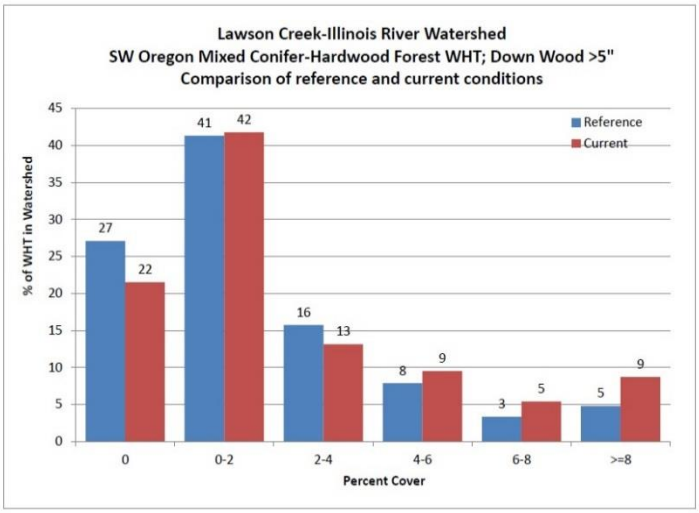
Figure 3. Histograms comparing the current and reference condition data for down wood in the ≥5" and ≥20" size classes within the Shasta Costa Creek- Rogue River, Stair Creek- Rogue River, and Lawson Creek- Illinois River HUC 10 watersheds

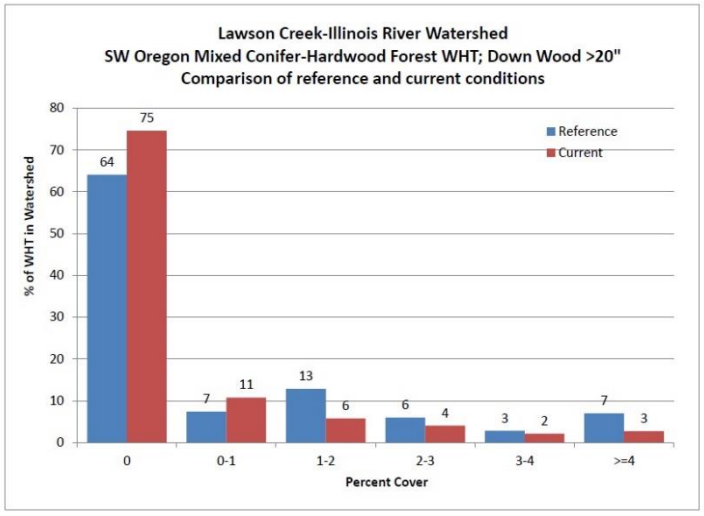












Summary and Conclusions

A comparison of current and historic levels of down wood within the Shasta Costa Creek- Rogue River, Stair Creek- Rogue River, and Lawson Creek- Illinois River HUC 10 watersheds suggests a general trend towards a slight increase in ≥5" diameter wood accumulation across the landscape when compared to the reference conditions that were extrapolated from ecological plot data. The data suggests that there is currently a greater portion of the landscape within the higher percentage of ground cover classes (4 to ≥8%) for small down wood (≥5") than what was present under reference conditions (Figure 3). One possible explanation for this may be seventy-five years of fire exclusion allowing for greater amounts of small material to accumulate than what would occur under an intact natural disturbance regime. For the larger size down wood class (≥20") the landscape appears closer to the estimated historic range of variability, with a slight trend towards an overall deficit in this type of structure. This is a consistent finding in the Pacific Northwest within watersheds that have had some level of clear-cut logging because it results in the nearly complete removal of potential large down wood recruitment in those patches of land.

The Shasta Costa and Stair Creek watersheds show a very similar scenario in relation to down wood cover. Within the higher (2-≥8%) cover classes the Stair Case watershed has seen an estimated 25% increase and Shasta Costa has increased by 23% when compared with reference conditions. These data suggest an ecological departure in the relative distribution and cover of small diameter wood across this landscape when compared to reference conditions. Unlike Lawson Creek, neither watershed is known to have experienced large (watershed or bigger) scale disturbance in the past 50 years, and neither are made up of large ultramafic areas, so it is not surprising to see a slightly different trajectory. For the larger size class (≥20") and higher percentage cover classes (1-≥4%) the change in distribution from reference conditions is even less pronounced. Within the higher (1-≥4%) classes there is an 8% increase in Shasta Costa and an 11% increase in Stair Creek. For both watersheds there is a slight 3% distribution decrease for the ≥4% cover class. Such a slight decrease falls within HRV levels, but does suggest a subtle loss in large diameter wood recruitment. As mentioned above watersheds with some level of historic clear-cut logging, like in Shasta Costa and Stair Creek, will typically show a trend towards a deficit in large down logs. These watersheds had relatively less clear-cut logging than many adjacent landscapes, so the deficit is apparently minimal.

Lawson Creek shows a slightly different trend in which small diameter (≥5") wood is almost at equilibrium with the estimated reference conditions. The biscuit fire, along with vast acreages of ultramafic geology, may be responsible for regulating the recruitment of small down wood across the landscape relative to the watersheds discussed above. Where Lawson Creek HUC 10 deviates is within the largest (≥20") size class of down wood. DecAid shows an estimated 14% decrease of large wood across the landscape within the higher (1-≥4%) cover classes. Each cover class with at least 1% cover and higher shows a slight deficit in relation to reference conditions, which is unique to this watershed in this analysis. The Biscuit and previous fires, along with a landscape dissected by sparse low growing ultramafic adapted vegetation could offer some explanation for the deficit. Very little clear-cut logging has occurred within this watershed, so that would not offer a plausible explanation. The measured departure of large wood identified through the GNN data and the DecAid analysis is not substantial when considering the scale and coarse level of the data being used.

The proposed action seeks to reduce stocking density in oak savanna and woodlands which historically had little down wood. Most oak restoration units within the project area show little percent cover of course down wood, even after decades of fire suppression (Figure 2). Down wood does not appear to be a limiting factor within this project area based on this analysis. If anything, the analysis shows a need to reduce density of small size class wood (5-20") while preserving large old trees that can be relied upon for future recruitment of down wood. The proposal also includes recreational enhancements and stream

restoration actions that are not likely to have any influence over the watershed scale recruitment or loss of down wood in this landscape.

Invasive Plant Species

Definition of an Invasive Plant

Those plant species designated as Invasive Plants by the Secretary of Agriculture or by the responsible State official. Invasive Plants generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier or host of a serious insect or disease, or being non-native or newly introduced and not common to the state. Generally, species that can survive and reproduce in a natural setting away from landscape areas are considered invasive.

Existing Condition

There are 18 species of Oregon Department of Agriculture prioritized invasive plant species within this landscape. There are currently 283 high priority invasive plant infestations mapped within the Shasta Agness planning area totaling approximately 1350 acres with treatments implemented on roughly 1100 acres (78%) over the past decade. Of those, approximately 90 infestations are within proposed treatment units or proposed recreation improvement footprints totaling approximately 305 acres and including the following species: Slender False Brome, Woolly Distaff Thistle, Italian plumeless thistle, Meadow Knapweed, Diffuse Knapweed, Spotted knapweed, Yellow star-thistle, Canada thistle, Scotch broom, French broom, Dyer's woad, Purple loosestrife, Himalayan blackberry, and English Ivy (Figure 4). Most sites have been treated in the past, but time and personnel restraints have not allowed annual monitoring and treatment of all sites as is needed. Annual monitoring and treatment is necessary to continue to control invasive plants within the project area boundary.

Himalayan blackberry is the dominant invasive plant. Himalayan blackberry currently causes the greatest harm to sensitive plant populations in the project area and poses the greatest imminent danger to existing populations. It is difficult and expensive to control. Manual control of the species is not feasible at the project scale with current funding allocations. Control using herbicides appears to be the most feasible alternative. However, public opposition to herbicide use on federal land has caused NEPA analysis of weed treatment using herbicides to be complicated and expensive.

The Shasta Agness project area has many other non-native species that can be considered weeds. The majority of the grassy areas in the project area are dominated by these undesirable non-native species. No special effort to control them is currently being conducted. The following species of grasses are non-native weedy species found in the project area: *Bromus hordeaceus* (soft brome), *Bromus rigidus* (rip-gut brome), *Bromus sterilis* (poverty brome), *Cynosurus echinatus* (hedgehog doglail), *Festuca arundinacea* (tall fescue), *Festuca pratensis* (meadow fescue) and *Holcus lanatus* (velvet grass).

The following list of forbs are weedy species found in the project area: *Crepis capillaris* (smooth hawksbeard), *Erodium cicutarium* (redstem storksbill), *Geranium dissectum* (cut-leaved geranium), *Geranium molle* (dovesfoot geranium), *Hypochaeris radicata* (false dandelion), *Myosotis discolor* (changing forget-me-not), *Prunella vulgaris* (self heal), *Scleranthus annuus* (German knotgrass), *Sherardia arvensis* (field madder), *Torilis arvensis* (field hedge-parsley), *Trifolium dubium* (hop clover), and *Vicia sativa* (spring vetch). These species are non-native plants that may dominate areas of disturbed soil.

Invasive plant infestations threaten native plant diversity within the project area. Invasive plant species pose a threat to ecological function due to their ability to displace native species, alter nutrient and fire cycles, and degrade soil structure.

Table 4 Oregon Department of Agriculture listed invasive plant species within the Shasta Agness Project Units

Invasive Plant Species	ODA Designation	Invasiveness	Approximate Acres within Treatment Units	Shasta Agness Project Units
Brachypodium sylvaticum (Slender False Brome)	B	Highly invasive and limited distribution	37.95	Burn Between unit 361 and 375; Oak unit 75 and 79; Fall Creek Burn Block and Oak Flat Burn Block
Carduus pycnocephalus (Italian plumeless thistle)	B	Highly invasive but widespread	0.89	Oak unit 79; Oak Flat Burn Block
Carthamus lanatus (woolly distaff thistle)	A &T	Highly invasive and limited distribution	0.08	Oak unit 79; Oak Flat Burn Block
Centaurea pratensis (meadow knapweed)	B	Highly invasive but widespread	28.81	Burn Between unit 375, Oak unit 80, 72; Fall Creek Burn Block; Oak Flat Campground; Foster Bar Campground Facility and Boat Launch; Plantation unit 222
Centaurea diffusa (diffuse knapweed)	B	Highly invasive and limited distribution	0.01	Shasta Costa Overlook Trailhead
Centaurea solstitialis (Yellow Star-thistle)	B	Highly invasive and limited distribution	33.68	Oak unit 4 and 72; Shasta Costa Burn Block; Foster Bar Campground Facility and Boat Launch, Oak Flat Campground
Centaurea stoebe (spotted knapweed)	B & T	Highly invasive and limited distribution	0.1	Plantation unit 222
Cirsium arvense (Canada thistle)	B	Highly invasive but widespread	1.67	Plantation unit 245 and Oak unit 12

Cytisus scoparius (Scotch broom)	B	Moderately invasive but widespread	27.14	Oak unit 1, 4, 5, 11, 50; Sugar pine unit 62; Serpentine Pine unit 102; Burn Between unit 303, 339; Agness Pass Burn Block, Billings Creek Burn Block; Shasta Costa Burn Block; Fall Creek Burn Block; Illahee Campground
Genista monspessulana (French broom)	B	Moderately invasive but widespread	15.46	Oak units 1, 2, 3, 4, 5, 11, and 55; Shasta Costa Burn Block; Billings Creek Burn Block
Hedera helix (English Ivy)	B	Highly invasive but widesperad	0.01	Oak unit 75; Fall Creek Burn Block
Isatis tinctoria (Dyer's woad)	B	Highly invasive and limited distribution	0.17	Oak Flat Campground
Lythrum salicaria (purple loosestrife)	B	Highly invasive and limited distribution	9.25	Foster Bar Campground Facility and Boat Launch
Rubus armeniacus (Himalayan blackberry)	B	Highly invasive but widespread	149.74	Oak unit 2, 75, 78, 79, 80; Burn Between unit 361, 339; Fall Creek Burn Block, Oak Flat Burn Block, Shasta Costa Burn Block, Billings Creek Burn Block; Plantation unit 215, 220; Upper Rogue River Trail Head.

ODA Definition of Designation:

"A" Listed Weed: A weed of known economic importance which occurs in the state in small enough infestations to make eradication or containment possible; or is not known to occur, but its presence in neighboring states make future occurrence in Oregon seem imminent

Recommended action: Infestations are subject to eradication or intensive control when and where found.

"B" Listed Weed: a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.

Recommended action: Limited to intensive control at the state, county or regional level as determined on a site specific, case-by-case basis. Where implementation of a fully integrated statewide management plan is not feasible, biological control (when available) shall be the primary control method.

"T" Designated Weed: a priority noxious weed designated by the Oregon State Weed Board as a target for which the ODA will develop and implement a statewide management plan. "T" designated noxious weeds are species selected from either the "A" or "B" list.

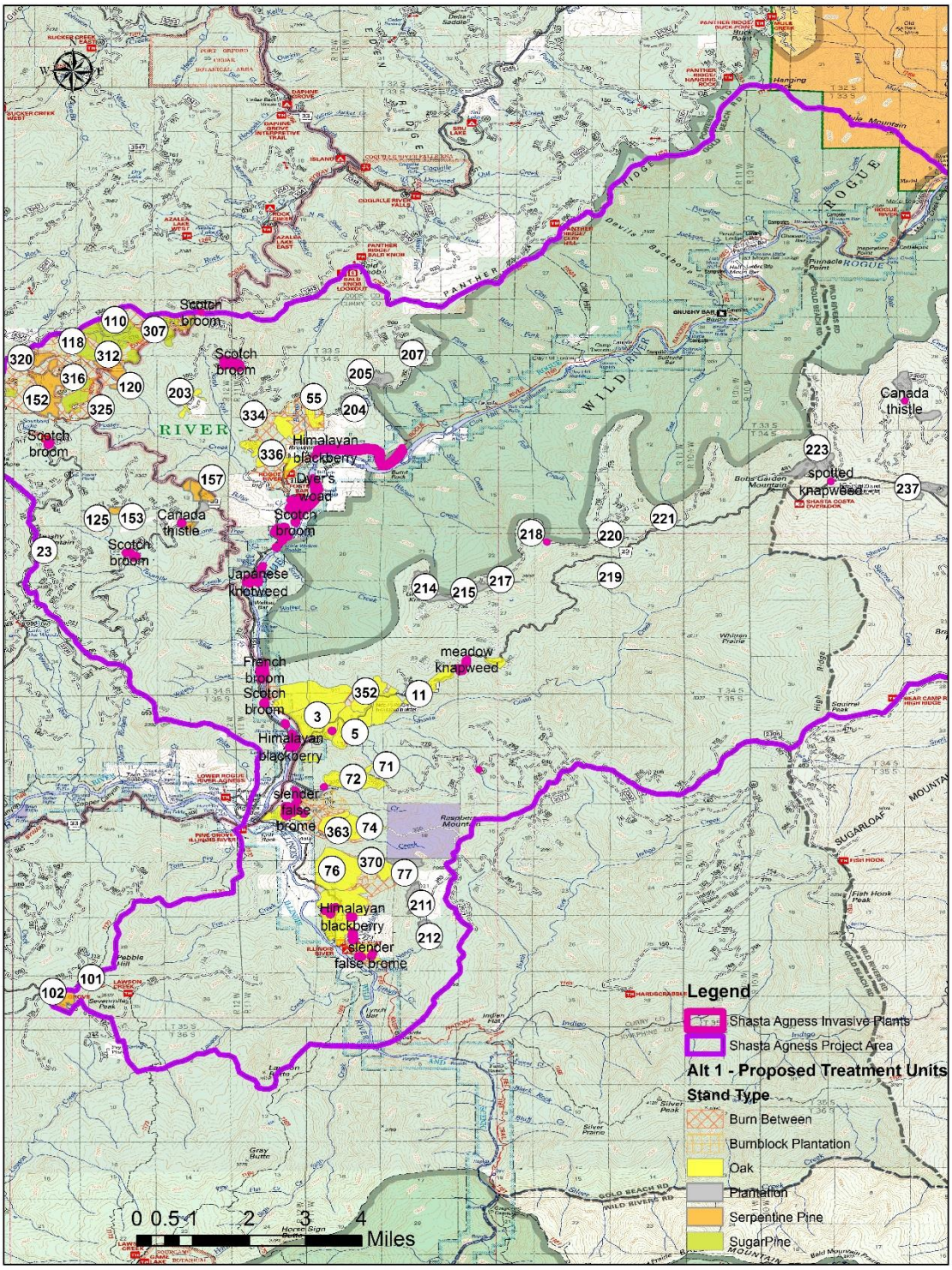


Figure 4. Oregon Department of Agriculture listed invasive plant species within or adjacent to Shasta Agness Project Units.

5. Environmental Consequences

Botanical resources are both purpose for and expected to be benefited by the proposed project specific forest plan amendment. Oak and pine restoration conducted under the amendment to cut trees greater than 80 years of age would contribute to ecosystem diversity. These unique oak ecosystems provide habitat for several sensitive or unique plant species including California maidenhair fern (*Adiantum jordanii*), Oregon timwort (*Cicendia quadrangularis*), Siskiyou trillium (*Trillium kurabayashii*), Camas (*Camassia quamash*), Leach's triteleia (*Triteleia hendersonii var. leachiae*), and California oatgrass (*Danthonia californica*). Areas historically occupied by open pine savannahs have experienced dense regeneration of pine species, incense cedar, tanoak, and brush species. Douglas-fir and other species from the surrounding forest also are encroaching, and are likely to negatively impact species diversity by changing soil and light conditions and by reducing the amount of area available for herbaceous plants. Serpentine savannahs are associated with one of the highest frequencies of sensitive and rare plants in the Klamath Mountains (Duebendorfer 1987; Goforth and Veirs 1989; Jimerson and others 1995; McGee-Houghton 1995; Whittaker 1960). Serpentine pine savanna provides habitat for several endemic species and sensitive species including *Monardella purpurea* and *Arctostaphylos hispidula*. There are at least 14 rare and endemic plant species represented by ~150 known populations within this landscape. 180 acres are currently mapped across the landscape with a majority of the species utilizing the mixed conifer oak woodland/savanna habitat type.

Region 6 Sensitive Species

Effects of Alternatives on Individual Sensitive Vascular Plant, Bryophytes and Lichen Species

The following sections provide a discussion of the direct, indirect, and cumulative effects of each alternative to individual sensitive plant species. Those species with the potential to be affected directly or indirectly by the proposed project (those within the project area or within 100 feet of proposed treatment areas) are discussed in detail in this document

Table 5.Comparison of Sensitive Plant Indicators and Measures for Vegetation Treatments by Alternative.

Species	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Acres within 100 feet of treatment unit	Number of sites within 100 feet of treatment unit	Acres within 100 feet of treatment unit	Number of sites within 100 feet of treatment unit	Acres within 100 feet of treatment unit	Number of sites within 100 feet of treatment unit	Acres within 100 feet of treatment unit	Number of sites within 100 feet of treatment unit
Adiantum jordanii (California maidenhair fern)	1.1	6	1.1	6	1.1	6	0	0
Arctostaphylos hispidula (Gasquet manzanita)	0.2	2	0.1	1	0.1	1	0	0
Bensoniella oregana (Oregon bensonia)	0.4	4	0.4	4	0.4	4	0	0

Cicendia quadrangularis (Oregon timwort)	0.5	1	0.5	1	0.5	1	0	0
Erigeron cervinus (Siskiyou daisy)	0.1	1	0.1	1	0.1	1	0	0
Gentiana setigera (Waldo gentian)	0.2	1	0.2	1	0.2	1	0	0
Iliamna latibracteata (California globe-mallow)	0.1	1	0.1	1	0.1	1	0	0
Monardella purpurea (Siskiyou monardella)	0.1	1	0.1	1	0.1	1	0	0
Scirpus pendulus (drooping bulrush)	0.1	1	0.1	1	0.1	1	0	0
Trillium kurabayashii (Siskiyou trillium)	23.1	8	23.1	8	22.8	6	0	0
Total effect	25.9	26	25.8	25	25.7	23	0	0

Adiantum jordanii (California maidenhair fern)

Direct and Indirect Effects of Alternative 1, 2, and 3

Cause and Effect Mechanisms

- ***Thinning:*** Under all alternatives individual plants/populations would be protected from site level logging activities so there would be no cause that would lead to direct effects in any of the alternatives. The thinning activity has the potential to cause indirect effects in Alternatives 1, 2 and 3 if invasive plant spread is triggered by decreasing overstory canopy cover in areas near to populations. Thinning would allow for prescribed under burning which is discussed below and has both the potential for beneficial and negative effects.

- ***Prescribed Burning:*** Direct flame and/or convective heat damage to some individuals or sub-populations is probable under alternatives 1, 2 and 3. Effects would be minimized by avoiding ignitions adjacent to plants, and by backing low intensity fire into the seasonal drainages where this plant grows. Low intensity fire has the potential for beneficial effects by stimulating the deep rooted rhizome of this fern and reducing competition from evergreen huckleberry (*Vaccinium ovatum*), and other dense growing shrub species as well as annual and perennial forb and grass species. Prescribed fire in conjunction with thinning has potential to cause indirect effects from invasive plant encroachment.

- ***Recreation Actions:*** There is no cause, therefore no effects because actions are spatially separated from populations and habitat of this species.

- ***Aquatic Restoration Actions:*** There is no cause for detrimental effects because there is no spatial intersection of proposed actions and California maiden hair fern populations. There is potential for beneficial effects from invasive plant removal within riparian areas.

- ***Invasive Plants:*** Blackberry grows well in seasonal drainages and has the ability to over top and outcompete this low growing sensitive fern species. Strictly following invasive plant PDC's is expected to minimize this, particularly a commitment to following up proposed actions such as thinning and burning with early detection and rapid response (EDRR) treatment efforts funded through Knutson Vandenberg Act funds and/or retained receipts from stewardship projects. These treatments should also include seeding and planting local native species where it is deemed

necessary. While the action alternatives have potential to increase indirect effects from invasive plant spread, they also provide an opportunity to obtain additional targeted funding in order to reduce current and ongoing infestations.

Prior to work beginning on the project, a botanist would meet with implementers and discuss strategies for maintaining and potentially enhancing each population. Monitoring and adaptive management would be pursued when possible. A botanist would flag all known occurrences before mechanical treatments and burning operations commence. Based on this assessment alternative 1, 2, and 3 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Cumulative Effects of Alternative 1, 2, and 3

It is likely, though we have no documented monitoring evidence, that this species has in the past and may currently be being impacted by invasive plant spread. The most likely impact is from blackberry, considering how frequent and abundant it is in this landscape and its ability to take over stream channels. There may also be potential for effects from fire exclusion, but again we have no quantitative evidence of this, only observational evidence suggesting successional patterns that favor evergreen huckleberry and tanoak establishment under dense Douglas fir canopy that, in the absence of fire, has increased in various locations throughout the landscape. There is also a possibility that past logging and road building has impacted populations of this species.

If there have been past negative effects from invasive plants, fire exclusion and/or past logging and road building then there are potential cumulative effects from implementing this proposed action because of the likelihood for additive based indirect effects from exacerbating blackberry spread. On the other hand the potential beneficial effects of burning could work to counter a small amount of the negative effects from fire exclusion by reducing cover and abundance of shade tolerant shrubs like evergreen huckleberry.

Direct and Indirect Effects of Alternative 4

No direct effects are anticipated because there are currently no known mechanisms for ongoing direct effects taking place in or near to populations of California maiden hair fern. Indirect effects from the current and ongoing spread of invasive plants and from fire exclusion are likely to be occurring to some of the populations and potential habitat. This rare fern species grows in intermittent stream beds under dense myrtle wood canopies and is not considered to be a species that depends on frequent mixed severity fire as a biological requirement, unlike some of the other sensitive plants discussed in this analysis. However, it grows directly adjacent to oak savanna and hardwood ecosystems which historically saw frequent low intensity fires. It is likely that the cooler and moister drainages where this species grows have a moderating effect on fire behavior. Fire exclusion likely does not directly effect this species, but there may be indirect effects from altered successional patterns promoting evergreen huckleberry and tanoak (*Notholithocarpus densiflorus*) to persist on the landscape more than what was expected under historical conditions. There is no way to quantify the level of these effects at this time.

Taking no action would continue to result in indirect effects from invasive plant spread and fire exclusion. Due to these ongoing indirect effects implementing alternative 4 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

***Arctostaphylos hispidula* (Gasquet manzanita)**

Direct and Indirect Effects of Alternative 1, 2 and 3

Cause and Effect Mechanisms

- ***Thinning:*** Under all alternatives individual plants would be protected from site level logging activities so there would be no cause that would lead to direct effects. One population occurs within plantation unit 212, which is proposed for treatment in Alternatives 1, 2, and 3. Prior to work beginning on the project, a botanist would flag this occurrence for avoidance of individual plants. The thinning activity has the potential to have indirect beneficial effects on this population by opening up the canopy. This species is a disturbance follower, believed to have evolved with the natural disturbance of wildfire and cultural burning. Considering the fact that so many Arctostaphylos species rely on disturbance such as fire, it seems reasonable that other disturbance mechanisms could create similar habitat. The physical soil disturbance and reduction in understory vegetation layer associated with thinning treatments may additionally have a beneficial indirect effect of promoting germination of new plants. Plants in undisturbed areas may be able to produce seeds that can take advantage of the post-project conditions. The reduction in canopy cover would likely favor survival and establishment of newly germinated and existing plants.

- ***Prescribed Burning:*** Direct flame and/or convective heat damage to some individuals or sub-populations is probable under alternatives 1, 2 and 3. Effects would be minimized by avoiding ignitions adjacent to plants, and by backing low intensity fire into populations. Low intensity fire has the potential for beneficial direct effects by reducing competition from other dense growing shrub species. Indirect effects by stimulating seed germination. *Arctostaphylos hispidula* is a fire dependent species with refractory seeds (Emerson 2010; Keeley 1991), though the needed intensity level of the fire is not known.

- ***Recreation Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Aquatic Restoration Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Invasive Plants:*** This species is less likely to be directly displaced than other sensitive plants within the project area by invasive species because it is often associated with serpentine soils and ultramafic geology. While the action alternatives have potential to increase indirect effects from invasive plant spread, strictly following invasive plant PDC's to prevent introduction of invasive plants to sensitive habitat would reduce this risk even farther.

Prior to work beginning on the project, a botanist would meet with implementers and discuss strategies for maintaining and potentially enhancing this population. Monitoring and adaptive management would be pursued when possible. A botanist would flag the known occurrence before mechanical treatment. Based on this assessment alternative 1, 2, and 3 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Cumulative Effects of Alternative 1, 2, and 3

Suitable habitat for this species has likely been impacted by past timber management practices and wildfire suppression, which has resulted in a greater number of dense forests that are dominated by small

trees and a reduction in open forest habitat across the landscape. There is only observational evidence suggesting successional patterns that favor evergreen huckleberry and tanoak establishment under dense Douglas fir canopy that, in the absence of fire, has increased in various locations throughout the landscape.

Direct and Indirect Effects of Alternative 4

No direct effects are anticipated because there are currently no known mechanisms for ongoing direct effects taking place in or near to populations of *Arctostaphylos hispidula*. Although there would be no direct effects from this alternative, there are possible negative indirect effects from no action. Indirect effects from no action would be those associated with tree density and overstory canopy cover reducing the amount of suitable habitat over the landscape. Based on our field assessments of a majority of all known sites in Oregon, the species appears to be stable to slightly declining, primarily due to fire exclusion (Emerson 2010). By not taking action, the canopy would not be reduced in the surrounding habitat of this population. Though the population may persist at its current level, it may not have additional habitat in which to expand. If it does not continue to experience natural or anthropogenic disturbances periodically, then eventually the forest canopy would close in and create conditions for more shade tolerant species to out compete this species for light and other resources.

Taking no action would continue to result in indirect effects from fire exclusion. Due to these ongoing indirect effects implementing alternative 4 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Bensoniella oregana (Oregon bensonia)

Direct and Indirect Effects of Alternative 1, 2 and 3

Cause and Effect Mechanisms

- ***Thinning:*** *Bensoniella oregana* is found in seeps, springs, moist meadows and wet roadside ditches along upper slopes and ridges. Under all action alternatives populations of *Bensoniella oregana* would be protected from site level logging activities therefore there would be no cause that would lead to direct effects. Two occurrences of this species occur within proposed Plantation unit 239, which is proposed for treatment in Alternatives 1, 2, and 3. Prior to work beginning on the project, a botanist would flag these populations for avoidance. This species may be indirectly affected during thinning activities by changing canopy cover or water availability due to roadwork.

- ***Prescribed Burning:*** Direct flame and/or convective heat damage to some individuals or sub-populations is probable under alternatives 1, 2 and 3. Effects would be minimized by avoiding ignitions adjacent to plants, and due to the location of *Bensoniella oregana* populations in wet areas.

- ***Recreation Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Aquatic Restoration Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Invasive Plants:*** The action alternatives have potential to increase indirect effects from invasive plant spread, but strictly following invasive plant PDC's to prevent introduction of invasive plants to sensitive habitat would reduce this risk.

Prior to work beginning on the project, a botanist would meet with implementers and discuss strategies for maintaining these populations. Monitoring and adaptive management would be pursued when possible. A botanist would flag the known occurrences before mechanical treatment. Based on this assessment alternative 1, 2, and 3 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Cumulative Effects of Alternative 1, 2, and 3

Suitable habitat for this species has likely been impacted by past management practices. It is likely, though we have no documented monitoring evidence, that this species has been impacted by past logging and road building activities. Populations of this species are sometimes found on existing road templates that have not been hydrologically disconnected. Past negative effects from changed hydrologic settings in addition to effects from this project may lead to cumulative effects to this species from implementing this proposed action. Though the effects of this project must be considered cumulatively with the effects of past management activities, it is also important to consider the context of these effects. There are 36 known occurrences of this species within 100 feet of the Shasta Agness Project area, but only two populations may be affected by this project.

Direct and Indirect Effects of Alternative 4

No direct or indirect effects are anticipated because there are currently no known mechanisms for ongoing direct or indirect effects taking place in or near to populations of *Bensoniella oregana.*

Cicendia quadrangularis (Oregon timwort)

Direct and Indirect Effects of Alternative 1, 2, and 3

Cause and Effect Mechanisms

- ***Thinning:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations.

- ***Prescribed Burning:*** *Cicendia quadrangularis* is an annual herb which grows in open places, vernally wet meadows and oak savanna. There is one known population of this species on the Rogue River- Siskiyou National Forest and it occurs within the Shasta Agness Project Area within Oak unit 79, which is proposed for treatment in Alternatives 1, 2, and 3; and in the Oak Flat Burn Block which is proposed for treatment in Alternatives 1 and 2. Direct effects to this species may occur due to direct flame or convective heat damage during prescribed burning. Effects would be minimized by avoiding ignitions adjacent to plants. Indirect effects may occur by introducing or encouraging invasive plants into *Cicendia quadrangularis* habitat. Burning in the spring when vernal pools are wet may minimize impacts to Cicendia quadrangularis. Spring burning may also reduce the competition of exotic annual grasses (Pollak and Kan 1998).

- ***Recreation Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Aquatic Restoration Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Invasive Plants:*** The action alternatives have potential to increase indirect effects from invasive plants by encouraging their spread post-prescribed fire. Monitoring this population pre and post prescribed fire would inform adaptive management strategies at this site.

Prior to work beginning on the project, a botanist would meet with implementers and discuss strategies for maintaining this population. Prior to burning operations, a botanist would mark this occurrence for avoidance during ignition. Ignition would not be allowed within the marked occurrence area, but fire would be allowed to creep into occurrence area. Monitoring and adaptive management would be pursued when possible. Based on this assessment alternative 1, 2, and 3 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Cumulative Effects of Alternative 1, 2, and 3

It is likely, though we have no documented monitoring evidence, that this species has in the past and may currently be being impacted by grazing and invasive plant spread. The most likely impact is from trampling due to cattle and non-native annual grass invasion decreasing the amount of habitat available for this species. This population is also likely affected by drought. If there have been past negative effects from grazing and invasive plants, then there are potential cumulative effects from implementing this proposed action because of the likelihood for additive based indirect effects from exacerbating invasive plant spread.

Direct and Indirect Effects of Alternative 4

No direct or indirect effects are anticipated because no project-related activities would occur.

Gentiana setigera (Waldo gentian)

Direct and Indirect Effects of Alternative 1, 2, and 3

Cause and Effect Mechanisms

- ***Thinning:*** There is one known occurrence of *Gentiana setigera* within the Shasta Agness Project Area within plantation unit 203, which is proposed for treatment in Alternatives 1, 2, and 3. This species is found in serpentine wet meadows, Darlingtonia bogs, and seeps on slopes. Direct effects to this species are not anticipated because the site would be flagged and avoided prior to thinning operations by a botanist. This species may be indirectly affected during thinning activities by changing canopy cover.

- ***Prescribed Burning:*** Direct flame and/or convective heat damage to some individuals or sub-populations is probable under alternatives 1, 2 and 3. Effects would be minimized by avoiding ignitions adjacent to plants, and due to the location of *Gentiana setigera* populations in wet areas.

- ***Recreation Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Aquatic Restoration Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Invasive Plants:*** This species is less likely to be directly displaced than other sensitive plants within the project area by invasive species because it is often associated with serpentine soils and ultramafic geology. While the action alternatives have potential to increase indirect effects from

invasive plant spread, strictly following invasive plant PDC's to prevent introduction of invasive plants to sensitive habitat would reduce this risk even farther.

Prior to work beginning on the project, a botanist would meet with implementers and discuss strategies for maintaining this population. Monitoring and adaptive management would be pursued when possible. A botanist would flag the known occurrences before mechanical treatment. Based on this assessment alternative 1, 2, and 3 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Cumulative Effects of Alternative 1, 2, and 3

Suitable habitat for this species has likely been impacted by past management practices. It is likely, though we have no documented monitoring evidence, that this species has been impacted by past logging. Past negative effects from changed hydrologic settings in addition to effects from this project may lead to cumulative effects to this species from implementing this proposed action.

Direct and Indirect Effects of Alternative 4

No direct or indirect effects are anticipated because there are currently no known mechanisms for ongoing direct or indirect effects taking place in or near to populations of *Gentiana setigera.*.

Iliamna latibracteata (California globe-mallow)

Direct and Indirect Effects of Alternative 1, 2, and 3

Cause and Effect Mechanisms

- ***Thinning:*** There are three known occurrences of this species within 100 feet of the Shasta Agness project area, none of which occur within any Shasta Agness treatment unit. One population occurs near plantation unit 218, which is proposed for treatment in Alternative 1, 2, and 3. Under all action alternatives individual plants would be protected from site level logging activities so there would be no cause that would lead to direct effects. The thinning activity has the potential to have indirect effects on this population by opening up the canopy. The species depends on disturbance specifically fire and open canopies and to regenerate, propagate, and maintain viable populations. It is an early seral species with high reproductive rates, and occurs in the types of unstable and changing habitats that follow both cooler understory fires and hotter stand replacing fires. The species can occur in the understory of top-killed stands, as well as at edges of or in gaps within live burned stands (Kalt, 2008). Taking these factors into consideration, it is expected that the proposed thinning treatments could result in the creation of additional areas of suitable habitat for California globe-mallow to colonize.

- ***Prescribed Burning:*** Direct flame and/or convective heat damage to some individuals or sub-populations is probable under alternatives 1, 2 and 3. Effects would be minimized by avoiding ignitions adjacent to plants, and by backing low intensity fire into populations. Low intensity fire has the potential for beneficial direct effects by reducing competition from other dense growing shrub species. Indirect effects by stimulating seed germination. *Iliamna latibracteata* is likely to resprout after fire as in other Iliamna species (Schwegman 1990, and Stickney 1985, 1986; cited in Baskin and Baskin 1997). I. latibracteata probably require heat-induced seed germination as do 5 other species from the genus (I. bakeri, I. remota, I. corei, I. longisepala, and I. rivularis)(Meinke 2001). It is expected that the proposed prescribed burning could result in the creation of additional areas of suitable habitat for California globe-mallow to colonize.

- ***Recreation Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.
- ***Aquatic Restoration Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.
- ***Invasive Plants:*** Most invasive plants are early seral species, growing well in post disturbance environments and outcompeting native plants. Strictly following invasive plant PDC's is expected to minimize this, particularly a commitment to following up proposed actions such as thinning and burning with early detection and rapid response (EDRR) treatment efforts funded through Knutson Vandenberg Act funds and/or retained receipts from stewardship projects. These treatments should also include seeding and planting local native species where it is deemed necessary. While the action alternatives have potential to increase indirect effects from invasive plant spread, *s*trictly following invasive plant PDC's to prevent introduction of invasive plants to sensitive habitat would reduce this risk.

Prior to work beginning on the project, a botanist would meet with implementers and discuss strategies for maintaining and potentially enhancing habitat for *Iliamna latibracteata*. Monitoring and adaptive management would be pursued when possible. A botanist would flag the known occurrence before project implementation to prevent inadvertent trampling. Based on this assessment alternative 1, 2, and 3 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Cumulative Effects of Alternative 1, 2, and 3

Suitable habitat for this species has likely been impacted by past management practices, such as over story removal and wildfire suppression, which has resulted in a greater number of dense forests that are dominated by small trees and a reduction in open forest habitat across the landscape. There is only observational evidence suggesting successional patters that favor evergreen huckleberry and tanoak establishment under dense Douglas fir canopy that, in the absence of fire, has increased in various locations across the landscape.

Direct and Indirect Effects of Alternative 4

No direct effects are anticipated because there are currently no known mechanisms for ongoing direct effects taking place in or near to populations of *Iliamna latibracteata*. Although there would be no direct effects from this alternative, there are possible negative indirect effects from no action. Indirect effects from no action would be those associated with tree density and overstory canopy cover reducing the amount of suitable habitat over the landscape. By not taking action, the canopy would not be reduced in the surrounding habitat of this population. Though the population may persist at its current level, it may not have additional habitat in which to expand. If it does not continue to experience natural or anthropogenic disturbances periodically, then eventually the forest canopy would close in and create conditions for more shade tolerant species to out compete this species for light and other resources.

Taking no action would continue to result in indirect effects from fire exclusion. Due to these ongoing indirect effects implementing alternative 4 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

***Monardella purpurea* (Siskiyou monardella)**

Direct and Indirect Effects of Alternative 1, 2, and 3

Cause and Effect Mechanisms

- ***Thinning:*** There is one known occurrence of this species within 100 feet of the Shasta Agness Project Area near plantation unit 245, which is proposed for treatment in Alternative 1, 2, and 3. This population is three feet from FSR 2909 on the downslope side. This population can feasibly be completely avoided during harvest operations, therefore no direct effect is anticipated. Habitat changes in the timbered stand following harvest are not expected to change conditions at the sparsely vegetated serpentine ridge where the *M. purpurea* population occurs, therefore no indirect effect is predicted.

- ***Prescribed Burning:*** Direct flame and/or convective heat damage to some individuals or sub-populations is probable under alternatives 1, 2 and 3. Effects would be minimized by avoiding ignitions adjacent to plants, and by backing low intensity fire into populations. Low intensity fire has the potential for beneficial direct effects by reducing competition from other dense growing shrub species.

- ***Recreation Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Aquatic Restoration Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.

- ***Invasive Plants:*** This species is less likely to be directly displaced than other sensitive plants within the project area by invasive species because it is often associated with serpentine soils and ultramafic geology. While the action alternatives have potential to increase indirect effects from invasive plant spread, strictly following invasive plant PDC's to prevent introduction of invasive plants to sensitive habitat would reduce this risk even farther.

Prior to work beginning on the project, a botanist would meet with implementers and discuss strategies for maintaining this population. Monitoring and adaptive management would be pursued when possible. A botanist would flag the known occurrences before mechanical treatment or roadwork. Based on this assessment alternative 1, 2, and 3 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Cumulative Effects of Alternative 1, 2, and 3

Suitable habitat for this species has likely been impacted by past timber management practices and wildfire suppression, which has resulted in a greater number of dense forests that are dominated by small trees and a reduction in open forest habitat across the landscape. There is only observational evidence suggesting successional patterns that favor evergreen huckleberry and tanoak establishment under dense Douglas fir canopy that, in the absence of fire, has increased in various locations throughout the landscape.

Direct and Indirect Effects of Alternative 4

No direct or indirect effects are anticipated because there are currently no known mechanisms for ongoing direct or indirect effects taking place in or near to populations of *Monardella purpurea.*

***Scirpus pendulus* (drooping bulrush)**

Direct and Indirect Effects of Alternative 1, 2, and 3

Cause and Effect Mechanisms

- ***Thinning:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations.
- ***Prescribed Burning:*** Drooping bulrush inhabits marshes, wet meadows, river terraces, and roadside ditches. There are three occurrences of this species within 100 feet of the Shasta Agness Project Area, one of which occurs in the ditch of the road that runs through Oak Flat Meadow within Oak unit 79, which is proposed for treatment in Alternatives 1, 2, and 3; and in the Oak Flat Burn Block which is proposed for treatment in Alternatives 1 and 2. Direct effects to this species may occur due to direct flame or convective heat damage during prescribed burning. Effects would be minimized by avoiding ignitions adjacent to plants. Indirect effects may occur by introducing or encouraging invasive plants into *Scirpus pendulus* habitat.
- ***Recreation Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.
- ***Aquatic Restoration Actions:*** There would be no direct or indirect effects to this species because actions are spatially separated from known populations and habitat.
- ***Invasive Plants:*** The action alternatives have potential to increase indirect effects from invasive plants by encouraging their spread post-prescribed fire. Monitoring this population pre and post prescribed fire would inform adaptive management strategies at this site.

Prior to work beginning on the project, a botanist would meet with implementers and discuss strategies for maintaining this population. Prior to burning operations, a botanist would mark this occurrence for avoidance during ignition. Ignition would not be allowed within the marked occurrence area, but fire would be allowed to creep into occurrence area. Monitoring and adaptive management would be pursued when possible. Based on this assessment alternative 1, 2, and 3 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Cumulative Effects of Alternative 1, 2, and 3

It is likely, though we have no documented monitoring evidence, that this species has in the past and may currently be being impacted by grazing and invasive plant spread. If there have been past negative effects from grazing and invasive plants, then there are potential cumulative effects from implementing this proposed action because of the likelihood for additive based indirect effects from exacerbating invasive plant spread.

Direct and Indirect Effects of Alternative 4

No direct or indirect effects are anticipated because there are currently no known mechanisms for ongoing direct or indirect effects taking place in or near to populations of *Scirpus pendulus*.

Trillium kurabayashii (*Siskiyou *trillium)

Direct and Indirect Effects of Alternative 1, 2, and 3

Cause and Effect Mechanisms

- ***Thinning:*** Siskiyou trillium occurs in proposed oak treatment units 2, 3, 5, 6, 50, 53, and 72 as well as Plantation unit 203. Ground disturbance from logging operations has the potential to cause direct effects to this species in all action alternatives by trampling plants. The action alternatives have the potential to cause indirect effects if invasive plant spread is triggered by decreasing overstory canopy cover in areas near populations of this species. Thinning would allow for prescribed under burning which is discussed below and has both the potential for beneficial and negative effects.

- ***Prescribed Burning:*** Siskiyou trillium occurs in the Shasta Costa Burn Block, Oak Flat Burn Block, and Billings Creek Burn Block. The species is dormant in the fall and has an underground bulb. This ecology likely gives it immunity to low intensity fall fires. Effects of burning on Siskiyou Trillium are unknown. However, it can be deduced that the Siskiyou Trillium is to some extent fire adapted from the species' dormancy during natural burn windows and its well established populations in the Agness Area (an area with historically high fire frequency). *Trillium kurabayashii* has been found growing out of burn scars in the Agness area (see cover photo). Although a fall burn may impact individual Siskiyou Trillium plants, it is not anticipated to have negative impacts on the species and may have long-term benefits.

- ***Recreation Actions:*** There is no cause, therefore no effects because actions are spatially separated from populations and habitat of this species.

- ***Aquatic Restoration Actions:*** There is no cause for detrimental effects because there is no spatial intersection of proposed actions and *Trillium kurabayashii* populations.

- ***Invasive Plants:*** Himalayan blackberry, a non-native weedy shrub, is a serious threat to the species because it grows in dense thickets and can smother out native forbs such as Siskiyou Trillium. Indirect effects from all action alternatives are expected due to invasive plant spread triggered by decreasing overstory canopy cover in areas near populations. Blackberry grows well in oak woodlands where Trillium also occurs, and has the ability to over top and outcompete this low growing sensitive plant. Strictly following invasive plant PDC's is expected to minimize this, particularly a commitment to following up proposed actions such as thinning and burning with early detection and rapid response (EDRR) treatment efforts funded through Knutson Vandenberg Act funds and/or retained receipts from stewardship projects. These treatments should also include seeding and planting local native species where it is deemed necessary. While the action alternatives have potential to increase indirect effects from invasive plant spread, they also provide an opportunity to obtain additional targeted funding in order to reduce current and ongoing infestations.

Prior to work beginning on the project, a botanist would meet with implementers and discuss strategies for maintaining and potentially enhancing each population. Monitoring and adaptive management would be pursued when possible. A botanist would flag all known occurrences before mechanical treatments and burning operations commence. Based on this assessment alternative 1, 2, and 3 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Cumulative Effects of Alternative 1, 2, and 3

It is likely, though we have no documented monitoring evidence, that this species has in the past and may currently be being impacted by invasive plant spread. The most likely impact is from blackberry, considering how frequent and abundant it is in this landscape and its ability to take over the understory of oak woodlands. There may also be potential for effects from fire exclusion, but again we have no quantitative evidence of this, only observational evidence suggesting successional patterns that favor evergreen huckleberry and tanoak establishment under dense Douglas fir canopy that, in the absence of fire, has increased in various locations throughout the landscape. There is also a possibility that past logging and road building has impacted populations of this species.

If there have been past negative effects from invasive plants, fire exclusion or past logging and road building then there are potential cumulative effects from implementing this proposed action because of the likelihood for additive based indirect effects from exacerbating blackberry spread. On the other hand the potential beneficial effects of burning could work to counter a small amount of the negative effects from fire exclusion by reducing cover and abundance of shade tolerant shrubs like evergreen huckleberry.

Direct and Indirect Effects of Alternative 4

No direct effects are anticipated because there are currently no known mechanisms for ongoing direct effects taking place in or near to populations of *Trillium kurabayashii*. Indirect effects from the current and ongoing spread of invasive plants and from fire exclusion are likely to be occurring to some of the populations and potential habitat. This species grows directly adjacent to oak savanna within hardwood ecosystems which historically saw frequent low intensity fires. Fire exclusion likely does not directly effect this species, but there may be indirect effects from altered successional patterns promoting more dense forests on the landscape than what was expected under historical conditions. There is no way to quantify the level of these effects at this time.

Taking no action would continue to result in indirect effects from invasive plant spread and fire exclusion. Due to these ongoing indirect effects implementing alternative 4 **"*may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species*" (MIIH)**.

Effects of Alternatives on Sensitive Fungi

Of the fourteen fungi with potential habitat on the Rogue River-Siskiyou National Forest, only *Gastrolactarius camphoratus* has reasonable likelihood of occurrence within the project area. For a full list of fungi species considered, see Appendix A of this report. This species occurs principally in soil and litter in western hemlock, tan oak, live oak, sugar pine, Douglas fir, Pacific madrone, California black oak, Port Orford cedar and Sitka spruce series at elevations of 3000-3385 feet of primarily moist forest types. It is known to be associated with the roots of Douglas fir and western hemlock and sometimes Pacific madrone, and incense cedar. Other woody associates include *Acer circinatum, Berberis nervosa* and *Vaccinium ovatum*. This project area is not indicative of high potential fungal habitat due to a frequent fire regime and lack of high decomposition rates associated with established duff or humus layers on the forest floor. Landfire 2012 data suggest the historic fire return interval to be approximately 6-15 years in dry forest types of the Siskiyou Mountains; similar to the ones found in the Shasta Agness project. *Gastrolactarius camphoratus* is a sequestrate fungus, or truffle, known from twenty sites in Oregon. The species is currently documented on the Gold Beach Ranger District from five sites. There are no known sites within the project area, but the species is likely to occur in the proposed project area.

The project is not likely to result in adverse impacts to local species populations or their habitat because the project design and proposed action retains the key elements of habitat for the species. This species has

a **reasonable likelihood of occurrence, but a low risk to species viability or trend toward listing for all action alternatives.**

NWFP Survey and Manage Plants, Lichens and Fungi

There are four plant, lichen or fungi species included in the January 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (USFS et al. 2001) with the potential to occur within the Shasta Agness Project area (Table 3; Table 6). For a full list of survey and manage species see Appendix A to this report.

Table 6. Summary of effects to Northwest Forest Plan Plants, Lichens and Fungi included in survey and manage standards and guidelines with the potential to occur within the Shasta Agness Project area (Dec. 2003 species list).

Species	Listing Category	RRS Occurrence Info	Known Project area Occurrences	Habitat	Effects Call	Rational for Determining of Effects
Leucogaster citrinus	Survey and Manage B	Documented	Yes	Found in association with the roots of *Abies concolor, A. lasiocarpa, Pinus contorta, P. monticola, Pseudotsuga menziesii,* and *Tsuga heterophylla* from 280 to 2,000 m elevation. Endemic to the Pacific Northwest.	NI	**One site occurs within the project area in the Wild Rogue Wilderness, but no sites occur within any Shasta Agness project units.**
Platismatia lacunosa (crinkled rag lichen)	Survey and Manage Category E	Oregon Coast Range Excluded From Management	Yes	This lichen species is restricted to western North America, from coastal northern California, north through coastal Alaska and the Aleutian Islands. This species is uncommon on the boles and branches of hardwood and conifer bark in moist, cool upland sites as well as moist riparian forest in the Coast Range and Cascades. Elevations range from sea level to 3500 feet. It is most commonly found on Alnus rubra; other substrates include western hemlock, Sitka spruce, cherry, vine maple, big-leaf maple.	MIIH	**One site occurs along FSR 3730060 and in oak unit 55 (Alt 1, 2, 3) and the Billings Creek Burn Block (Alt 1, 2). This site would be buffered by 100 feet during implementation. Protection of riparian zones and wetland areas and retention of hardwood trees would minimize habitat loss. Riparian and upland stands with a high proportion of hardwoods are important "hotspots" of lichen diversity, providing habitat for many species that are poorly represented in typical forests (Peterson and McCune 2003).**
Rhizopogon truncatus	Survey and	Suspected	Yes	Hypogeous to emergent, scattered to grouped associated	NI	**One site occurs within the project area, but no sites are**

	Manage Strategy D			with Pinaceae species particularly *Pinus* spp. Occurs in Sierra, Siskiyou, and Cascade mountains of northern California into the central Oregon Cascades, also from North Carolina to Nova Scotia.		**known within any Shasta Agness project units.**
Usnea longissima	Survey and Manage Category A	Documented	Yes	Coast Range on deciduous trees and shrubs as well as PSME. Often in or near riparian settings or on ridge tops above rivers.	MIIH	**One site occurs in oak unit 51 (Alt 1, 2, 3) and the Billings Creek Burn Block (Alt 1, 2). This site would be buffered by 100 feet during implementation. The location is in a grassland oak savanna. No encroaching trees are in the immediate vicinity so there would be no change in the canopy closure surrounding the site. Retention of hardwood trees would minimize habitat loss.**
Surveys and Site Management to Consider Based on Category: **Category A** – conduct pre-disturbance surveys and manage all known sites; **Category B** – for the fungi & lichens, conduct equivalent-effort surveys in old-growth forest only and manage all known sites. **Category C** – conduct pre-disturbance surveys and manage high-priority sites; **Category D** – manage high-priority sites; **Category E** – manage all known sites; **Category F** – no requirement for project implementation; strategic surveys address information needs in relation to basic criteria for S&M; strategic surveys are the responsibility of the Regional Office and not field units.						
Definition of Effects Calls. **NI = No impact.** **MIIH = May impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species** **WIFV = Will impact individuals or habitat with a consequence that the action may contribute to a trend towards federal listing or cause a loss of viability to the population or species** **BI = Beneficial impact**						

Platismatia lacunosa (crinkled rag lichen)

Platismatia lacunosa (crinkled rag lichen) is a Category E Survey and Manage lichen species. One site of this species occurs along FSR 3730060 and in oak unit 55, which is proposed in all action alternatives, and the Billings Creek Burn Block, which is proposed for prescribed burning in alternatives 1 and 2. Category E Survey and Manage species require management of all known sites. This site would be buffered by 100 feet during implementation.

Protection of riparian zones and wetland areas and retention of hardwood trees would minimize habitat loss for this species. Riparian and upland stands with a high proportion of hardwoods are important "hotspots" of lichen diversity, providing habitat for many species that are poorly represented in typical forests (Peterson and McCune 2003).

All action alternatives **may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species.**

Usnea longissima

Usnea longissimima is a Category A Survey and Manage lichen species often in or near riparian settings or on ridge tops above rivers. One site occurs in oak unit 51, which is proposed for treatment in all action

alternatives, and the Billings Creek Burn Block, which is proposed for prescribed burning in alternatives 1 and 2. This site would be buffered by 100 feet during implementation. The location is in a grassland oak savanna. No encroaching trees are in the immediate vicinity so there would be no change in the canopy closure surrounding the site. Retention of hardwood trees would minimize habitat loss for this species

All action alternatives **may impact individuals or habitat, but would not likely contribute to a trend towards federal listing, or cause a loss of viability to the population or species.**

Down Wood

Direct and Indirect Effects of Alternative 1, 2, and 3

In relation to the results of the DecAid analysis an important factor to take into account is that this project falls within the Klamath-Siskiyou physiographic province, an ecologically rich portion of Oregon that is maintained by moderately frequent mixed severity fire. Where fires burned early successional and younger forest stand conditions, dead wood legacies were typically much lower and composed of smaller pieces (Spies et al. 1988, Nonaka et al. 2007).The plant communities within Shasta Agness Project proposed units are indicative of species that thrive after a fire disturbance. These communities evolved with a more open canopy and less overall down wood (Tiejte et al. 2002). This context must be considered when considering management strategies and effects to down wood and snags within this particular ecosystem. Managing for high loads of down wood and snags in land types that did not historically support these attributes is counter to ecosystem management.

The DecAid down wood distributional analysis lends credence to observations on the ground suggesting there has been an increase in small diameter trees in this landscape. The data show that this has led to excess amounts of small diameter trees in overplanted plantations and from encroachment into oak savanna/woodland and serpentine openings. The likely causes for this are historical clear-cut logging of old growth forest on mostly cool and moist north aspects and fire exclusion on ridges and dry south facing slopes. According to the GNN driven DecAid data this is leading to a trend towards an overabundance in small size class (≥5") down wood across the landscape. How this effects mycorrhizal symbioses and other microbiota through changes to nutrient cycling is unknown, but since there is a causal agent (overall increase of small diameter down wood) then there is likely an effect. It is probable that this favors (and increases) fungi and microbiota species that perform successional functions such as breaking down small diameter conifer down wood, serving to move these systems towards more conifer domination. Quantifying these effects is not possible at this time given the limited knowledge there is about fungi.

Implementing these proposed actions would impact roughly 0.08% of the total landscape in the Shasta Agness project. The scale of the proposed actions indicate nominal effects to down wood levels, and in turn mycorrhizal and micro biotic species, when considering the scope of the analysis. The project would cause a very slight reduction in trees 22-26" DBH as most trees removed would be from smaller size classes in the 12-22" DBH range (see silvicultural report). At the stand scale there would be a decrease in small to medium diameter wood that is available within these ecosystems. The tradeoff here is the short term loss of smaller diameter down wood for the long term gain of biodiversity and the potential to increase growth rates of remaining conifers which then could become larger down wood in the future.

Considering that oak savanna/woodland has been shown to have relatively low amounts of coarse woody debris (Tiejte et al. 2002, Figure 2) it would not make ecological sense to manage these areas towards increased down wood as might be done in old growth Douglas fir forest or plantations. The proposed actions will reduce potential down wood recruitment by removing live boles of trees, but the impact will be beneficial for maintaining the diverse plant communities associated with oak savanna and woodland.

Increased down wood in these ecosystems is serving to move them toward a successional pattern that favors dense coniferous forest rather than open growing oak savanna/woodland with diverse forb (including sensitive plants) and grass species growing in the understory. One of the main purposes of the project is to respond to this very issue. While the effects of the project will result in slightly less down wood, the effects to oak savanna associated native plant communities are likely beneficial.

Within Jeffrey pine dominated serpentine savanna the issue is very similar to oak savanna/woodland. Therefore similar environmental effects are expected. A short term reduction in down wood, but a long term benefit to the ecosystem and biodiversity as a whole.

The sugar pine sites are different because they are seral driven more so than edaphically driven, as with the two former ecosystems. Although, some of the sugar pine units occur in physiographic conditions that favor early to mid-seral regeneration on a more frequent basis. Therefore it can be inferred that physiography is driving much of the fire regime, vegetation and seral transitions in the Klamath-Siskiyou through a self-reinforcing pattern (Halofsky et al. 2011). Implementing the proposed actions within the sugar pine units will result in a reduction of down wood recruitment. The purpose of the project is inherently to conserve the large old sugar pine while creating openings that could help spur the regeneration of seedlings so there is a tradeoff in order to achieve this goal. The tradeoff results in a short to midterm loss in mortality suppression relative to the long term goal of sugar pine maintenance and regeneration.

The plantations are likely to have seen the greatest increase in small sized class down wood as well as the largest decrease in large diameter down wood. This is the result of historically focusing harvests on high productivity ground (northerly aspects) in old growth forests coupled with overstocking the areas by planting Douglas fir at narrow spacing. Thinning these areas there will result in a decrease of small diameter wood recruitment and increase the potential to recruit large diameter wood in the future. Theoretically this will help move these ecosystems towards conditions that favor late seral to old growth conditions. Direct and indirect effects to mycorrhizal and microbiotic species would initially be realized through a reduction in decomposition potential but over the long term the seral species associated with nutrient cycling would be balanced to more natural conditions as the forest increases in age and microsite conditions are restored.

To conclude, the ecosystems within the planning area landscape have been shown to be ecologically departed from HRV conditions through this DecAid analysis as well as through research (Haugo et al. 2014). The main causes for the departure are past logging and fire exclusion that have led to dense overstocked plantations and thousands of acres of encroachment into unique ecosystems by Douglas fir. The proposed project seeks to address this at a very small scale (<1% of the planning area landscape). It is determined that in relation to nutrient cycling by saprophytic and mycorrhizal fungi as well as microbiota this project would have little to no effect on down wood relationships considering the scope and scale of the project. There would be decreases in down wood at the site scale over the short term, but this must be considered in the context of what DecAid showed; which is a trend towards an excess of small diameter wood in the landscape.

Cumulative Effects of Alternative 1, 2, and 3

There have been negative effects to down wood recruitment from past management within this landscape. Most of this has been from building roads and logging old growth forests on north aspects. Some of the deficit in large diameter wood, shown through the DecAid analysis, is likely due to this. This proposal does not intend to remove more large wood from the ecosystem as it focuses on plantation thinning and removal of small to medium sized encroaching conifers in edaphic adapted oak savanna/woodlands, Jeffrey pine serpentine savanna and seral forests where sugar pine is being lost to succession. Given the

context of these ecosystems and the results of the DecAid analysis which shows an increase in small diameter down wood recruitment there would be little to no cumulative effects to down wood recruitment through implementation of this project. While there could be some beneficial effects by reducing the amount of small diameter wood, it is thought the additive nature of this is nominal and of no consequence to the greater landscape.

Direct and Indirect Effects of Alternative 4

The no action alternative maintains the current trajectory of down wood in the Shasta Costa Creek- Rogue River, Stair Creek- Rogue River, and Lawson Creek- Illinois River HUC 10 watersheds assuming that large scale natural disturbances continue to be excluded. The distribution analysis using DecAid puts the issue of down wood recruitment into a landscape based context. The result of the analysis reveals that smaller sized down wood (≥5") across the landscape is departed from the reference period with current conditions showing more abundant amounts of small wood within vegetation communities across the watersheds. The larger sized down wood class (≥20") is closer to equilibrium with regard to reference and current conditions. The no action alternative would result in a higher amount of smaller sized down wood within the project area than under the action alternatives.

This would result in continuing a trend towards an excess of small down wood across this landscape and may or may not have negative effects on mycorrhizal associated species and microbiota. There is not enough research to understand how fire exclusion and overstocking of plantations has affected nutrient cycling systems that are catalyzed by these organisms.

Invasive Species

Habitat Vulnerability

Vulnerability to invasive plant invasion and establishment is greatly influenced by plant cover, soil cover, and overstory shade. Invasive plants are predominantly found in riparian areas, open meadows and roadsides within the project area. The area is frequently used for recreational activities including hunting, hiking, camping, fishing and woodcutting. Past fuels treatments and prescribed burning resulted in areas of open canopy and disturbed ground.

Non-project Dependent Factors

Non-project dependent factors include: known invasive plant infestations, existing roads, public use, and ongoing land management activities such as grazing, prescribed burning, unauthorized off-highway vehicle use, and road maintenance. The areas at greatest risk in this proposed project area are those located next to roads. Roads increase risk of invasive plant infestation by allowing easier movement by wild or human vectors. There is a high risk of invasive plant spread due to non-project dependent factors.

Project Dependent Factors

Vegetation treatments and prescribed fire increase the risk of invasive plant invasion through soil disturbance, changes in vegetation structure, and the introduction of weed seeds through machinery, equipment and increased traffic from workers during project implementation. Invasive plant species have the potential to spread into the project area if seeds are brought to the site trapped in off-site road rock, wheel wells, under carriages of vehicles or on other needed machinery. The standard management requirement of washing all off-road equipment prior to entering National Forest System (NFS) land is reasonably effective at minimizing this risk.

Prescribed burning in the Shasta Agness Project would create environmental conditions favorable to invasive plant invasion. Reduced canopy cover and increased sunlight and bare soils following fire provide ideal conditions for invasive plants. Furthermore, studies and observations have shown that non-native plants occur more often, and in greater numbers, in areas of anthropogenic disturbance within burned areas (as opposed to undisturbed portions of burned areas) (Zouhar et al. 2008).

Non-fire disturbances create the opportunities for establishment by initially opening up the canopy, disturbing soils, and carrying seeds on tools and equipment, while fire exacerbates spread with further reduction of canopy cover and ground cover. If bare soils are left after burning, conditions are ideal habitat for early colonizers such as invasive plants. Riparian areas and meadows are highly susceptible to invasion from aggressive invasive plant species, such as Himalayan blackberry, Canada thistle, Woolly Distaff Thistle, Italian plumeless thistle, Meadow Knapweed, Diffuse Knapweed, Spotted Knapweed, yellow star thistle and purple loosestrife. Upland areas may be invaded by a host of invasive plants such as Slender False Brome, English ivy, Scotch broom, French broom and non-native annual grasses such as hedgehog dogtail (*Cynosurus echinatus*) and rip-gut brome (*Bromus rigidus*).

All action alternatives pose an increase in the risk of invasive plant invasion and spread compared to taking no action due to increased vectors and habitat alteration. The highest risk areas are the oak savanna and woodland areas that are already adjacent to large populations of blackberry and other invasive plants. The plantation, sugar pine and serpentine areas are at much less risk due to their proximity to known invasive plant populations on the forest. The serpentine areas are generally less susceptible to invasion because of the inability for non-native species to adapt to the heavy mineral content.

PDC's for the project would ameliorate the high risk to the maximum extent possible. EDRR strategies would be funded with Knutson Vanderberg or stewardship dollars. A new forest wide invasive plant strategy is in the process of going through NEPA and would be used to ensure all options are available for site treatments. New sites would be treated and revegetated with native grass and forb seed as well as containerized seedlings. A site specific native plant revegetation plan would be written for the oak savanna and woodland areas so that seed and plants would be available to quickly restore those areas. The district has already been stockpiling seed from this area and is prepared to increase the volume and output of both seed and containerized plants.

Implementing all these PDC's would greatly reduce the potential risk of invasive plant effects from spreading and increasing.

Under the no action alternative weed populations would continue to be treated through existing funding levels. There would be no additional exposed soil caused by harvest equipment or burning. There would be little change in the weeds in the project area. Numerous weedy grasses and forbs would continue to dominate most of the grassy meadows in the project area. Himalayan blackberry would continue to slowly expand and slowly displace sensitive plant populations.

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